



INDIAN AGRICULTURAL
RESEARCH INSTITUTE, NEW DELHI.

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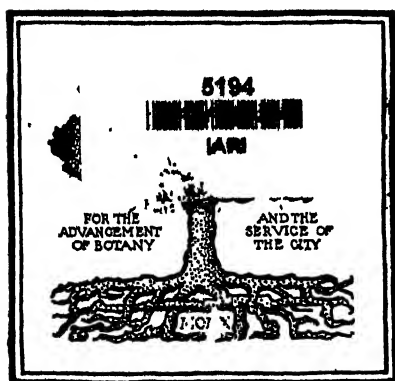
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BROOKLYN BOTANIC GARDEN RECORD

EDITED BY
C. STUART GAGER



VOLUME XXIII

1934

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INFORMATION CONCERNING MEMBERSHIP

The Brooklyn Institute of Arts and Sciences is organized in three main departments: 1. The Department of Education. 2. The Museums. 3. The Botanic Garden.

Any of the following seven classes of membership may be taken out through the Botanic Garden:

1. Annual member	\$ 10
2. Sustaining member	25
3. Life member	500
4. Permanent member	2,500
5. Donor	10,000
6. Patron	25,000
7. Benefactor	100,000

Sustaining members are annual members with full privileges in Departments one to three. Membership in classes two to seven carries full privileges in Departments one to three.

In addition to opportunities afforded to members of the Botanic Garden for public service through coöperating in its development, and helping to further its aims to advance and diffuse a knowledge and love of plants, to help preserve our native wild flowers, and to afford additional and much needed educational advantages in Brooklyn and Greater New York, members may also enjoy the privileges indicated on the following page.

Further information concerning membership may be had by addressing The Director, Brooklyn Botanic Garden, Brooklyn, N. Y., or by personal conference by appointment. Telephone, Prospect 9-6173.

PRIVILEGES OF MEMBERSHIP

1. Free admission to the buildings and grounds at all times.
2. Cards of admission for self and friends to all exhibitions and openings preceding the admission of the general public, and to receptions.
3. Services of docent (by appointment), for self and party (of not less than six), when visiting the Garden.
4. Admission of member and one guest to field trips and other scientific meetings under Garden auspices, at the Garden or elsewhere.
5. Free tuition in most courses of instruction; in other courses a liberal discount from the fee charged to non-members.
6. Invitations for self and friends to spring and fall "Flower Days," and to the Annual Spring Inspection.
7. Copies of Garden publications, as follows:
 - a. RECORD (including the ANNUAL REPORT).
 - b. GUIDES (to the Plantations and Collections).
 - c. LEAFLETS (of popular information).
 - d. CONTRIBUTIONS (on request. Technical papers).
8. Announcement Cards (Post Card Bulletins) concerning plants in flower and other items of interest.
9. Privileges of the Library and of the Herbarium.
10. Expert advice on the choice and care of ornamental trees, shrubs, and herbaceous plants, indoors and out; on planting the home grounds; the care of lawns; and the treatment of plants affected by insect and fungous pests.
11. Determination of botanical specimens.
12. Participation in the periodical distribution of surplus plant material and seeds, in accordance with special announcements sent to members from time to time.
13. Membership privileges in other botanic gardens and museums outside of Greater New York, when visiting other cities, and on presentation of membership card in Brooklyn Botanic Garden.

OUT-OF-TOWN MEMBERSHIP PRIVILEGES *

In accordance with a cooperative arrangement with a number of other institutions and organizations, Brooklyn Botanic Garden members, when visiting other cities, may, on presentation of their Botanic Garden membership card at the office of the cooperating museum or organization, be accorded, without charge, the same privileges as are enjoyed by the members of that institution, including admission to exhibits and lectures, and invitation to social events, if any. This does not include being enrolled on the mailing list for publications, and does not include free admission to the Philadelphia and Boston spring Flower Shows.

In reciprocation, the members of the cooperating units, when visiting the Metropolitan district of Greater New York, will be accorded full membership privileges at the Brooklyn Botanic Garden.

The cooperating units, beginning as of September, 1934, are as follows:

- Boston Society of Natural History.
- Buffalo Museum of Natural History.
- Field Museum of Natural History (Chicago).
- Massachusetts Horticultural Society (Boston).
- Missouri Botanical Garden (St. Louis).
- Newark Museum (New Jersey).
- Pennsylvania Horticultural Society (Philadelphia).

* Announced here for the first time.

GENERAL INFORMATION CONCERNING THE ACTIVITIES OF THE BROOKLYN BOTANIC GARDEN

THE BROOKLYN BOTANIC GARDEN, established in 1910, is a department of the Brooklyn Institute of Arts and Sciences. It is supported in part by municipal appropriations, and in part by private funds, including income from endowment, membership dues, special contributions, and tuitions. Its articulation with the City is through the Department of Parks.

By an Agreement with the City of New York, the functions of the Garden have been defined as two-fold: first, the advancement of botanical science through original research; and second, the dissemination of a knowledge of plants.

The first of these activities is carried on by director, curators, resident investigators, fellows, and others, who devote all or a part of their time to independent investigation. At present these investigations include studies in genetics, plant pathology, systematic botany, economic botany, and horticulture.

The dissemination of botanical knowledge is accomplished in the following ways:

I. By the teaching of classes—

- (a) of adults who are interested in some phase of pure or applied botany, or of horticulture;
- (b) of teachers of botany, biology, and nature study, who come for special courses on the subject matter or teaching methods of their subjects;
- (c) of children who come voluntarily outside of school hours;
- (d) of children who come with their teachers from public and private schools for special lessons on plant life and closely related subjects.

II. By lectures at schools, garden clubs, and elsewhere by staff members.

III. By broadcasting.

IV. By loan sets of lantern slides accompanied by lecture text. for use in the schools.

- V. By the distribution to schools of study material for classes in botany, biology, and nature study.
- VI. By public lectures and educational motion pictures at the Botanic Garden.
- VII. By maintaining labelled collections of living plants, arranged systematically, ecologically, and otherwise on the grounds and in the Conservatories of the Garden.
- VIII. By the herbarium, containing specimens of preserved plants from all parts of the world.
- IX. By maintaining a reference library on plant life and related subjects, open free to the public daily (except Sundays and holidays).
- X. By the following periodicals and publications issued by the Botanic Garden :
 - 1. American Journal of Botany (Monthly, except August and September).
 - 2. Ecology (Quarterly).
 - 3. Genetics (Bimonthly).
 - 4. Brooklyn Botanic Garden RECORD, including Annual Report and Guides. (Quarterly.)
 - 5. Leaflets (Weekly or biweekly in Spring and Fall).
 - 6. Contributions (Irregular).
 - 7. Memoirs (Irregular).
 - 8. Miscellaneous :
 - Syllabi of lectures.
 - Guide sheets for classes.
 - Announcement cards and circulars.
 - Bibliographies.
 - Miscellaneous books and booklets.
- XI. By popular and technical articles in journals and the public press, including regular "News Releases" concerning Botanic Garden activities and events.
- XII. By the maintenance of a Bureau of Public Information on all phases of plant life.
- XIII. By providing docents to accompany members and others who wish to view the collections under guidance.
- XIV. By the installation of botanical and horticultural exhibits at

the Garden, the International Flower Show, and elsewhere.

- XV. By cooperating with City Departments (e.g., Department of Parks and Board of Health) and other agencies in the dissemination of botanical knowledge.

The Brooklyn Botanic Garden is also taking an active part in the nation-wide movement for Scenic Preservation and legislation for the conservation of our native American plants.

A brief summary and report of the public educational work of the Garden from 1910 to 1928, with some attempt to set forth the fundamental principles upon which it is based, was published in the Brooklyn Botanic Garden RECORD for July, 1929. This is now out of print, but may be found on file at most of the larger libraries of the country.

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Plantations, comprising Systematic Section, Local Flora Section, Japanese Garden, Rock Garden, Rose Garden, and various Horticultural Displays. Flower Days.

Conservatories, Herbarium, Library, Laboratory Building, Instructional Greenhouses, Children's Room, Children's Building, Children's Garden, Shakespeare Garden, Meridian Panel, Armillary Sphere, Labelled Boulders, Etc.

BROOKLYN BOTANIC GARDEN RECORD

VOL. XXIII

JANUARY, 1934

NO. 1

DELECTUS SEMINUM, BROOKLYN 1933

LIST OF SEEDS OFFERED IN EXCHANGE

These seeds, collected during 1933, are offered to botanic gardens and to other regular correspondents; also, in limited quantities, to members of the Brooklyn Botanic Garden. They are not offered for sale.

Applications for seeds must be received during January or February. Latest date March 15, 1934.

SEEDS OF HERBACEOUS PLANTS

DICOTYLEDONES

- | | |
|--|---|
| <p>Amarantaceae 79</p> <p><i>Alternanthera</i></p> <p style="padding-left: 20px;"><i>Achyrantha</i> R. Br.</p> <p style="padding-left: 20px;"><i>sessilis</i> (L.) R. Br.</p> <p style="padding-left: 20px;"><i>spinosa</i> L.</p> <p><i>Amarantus</i></p> <p style="padding-left: 20px;"><i>caudatus</i> L.</p> <p style="padding-left: 20px;"><i>caudatus</i> var. <i>albiflorus</i> Hort.</p> <p style="padding-left: 20px;"><i>tricolor splendens</i></p> <p><i>Celosia</i></p> <p style="padding-left: 20px;"><i>argentea</i> var. <i>Childsii</i> (crimson)</p> | <p style="padding-left: 20px;">var. <i>Childsii</i> (yellow)</p> <p style="padding-left: 20px;">var. <i>chrysanthiflora</i></p> <p style="padding-left: 20px;">var. "Glasgow Prize Crimson"</p> <p style="padding-left: 20px;">var. <i>Thompsonii</i></p> <p><i>Froelichia</i></p> <p style="padding-left: 20px;"><i>gracilis</i> Moq.</p> <p style="text-align: center;">Apocynaceae 247</p> <p><i>Apocynum</i></p> <p style="padding-left: 20px;">*<i>androsaemifolium</i> L.</p> <p style="text-align: center;">Araliaceae 227</p> <p><i>Aralia</i></p> <p style="padding-left: 20px;">*<i>nudicaulis</i> L.</p> |
|--|---|

* Seeds collected from wild plants.

Asclepiadaceae 248

- Amsonia
 Tabernaemontana Walt.
 Asclepias
 *incarnata L.
 *tuberosa L.

Balsaminaceae 168

- Impatiens
 Balsamina L.
 *biflora Walt.

Berberidaceae 93

- Caulophyllum
 *thalictroides Michx.
 Podophyllum
 *peltatum L.

Boraginaceae 252

- Anchusa
 azurea Rchb.
 officinalis L.

Cactaceae 210

- Opuntia
 tortispina Engelm.
 *vulgaris Mill.

Campanulaceae 276

- Campanula
 latifolia L. var. eriocarpa
 DC.
 Platycodon
 grandiflorum DC.

Capparidaceae 107

- Cleome
 serrulata Pursh
 viscosa L.
 Polanisia
 trachysperma T. & G.

Caryophyllaceae 87

- Arenaria
 graminifolia Schrad.
 Koriniana Fisch.
 Cerastium
 *arvense L. var. villosum
 Hollick & Brit.
 Dianthus
 Armeria L.
 Lychnis
 alba Mill.
 Coronaria atropurpurea
 Silene
 ciliata Pourr.
 japonica Rohrb.
 latifolia Brit. & Rendle
 maritima With.
 orientalis splendens
 *pennsylvanica Michx.
 Tunica
 Saxifraga Scop.

Chenopodiaceae 78

- Beta
 vulgaris L. var. Cicla Moq.
 Roubieva
 multifida Moq.

Cistaceae 193

- Helianthemum
 *canadense (L.) Michx.
 guttatum Mill.
 Hudsonia
 *ericoides L.
 *tomentosa Nutt.
 Lechea
 *Leggettii Brit. & Hollick
 *villosa Ell.

Compositae 280

- Anaphalis
 *margaritacea Benth. &
 Hook.

Artemisia
Purshiana Bess.

Aster
*concolor L.
*depauperatus (Porter)
Fernald
*divaricatus L.
*dumosus L.
*ericoides L.
*gracilis Nutt.
*laevis L.
*linariifolius L.
*macrophyllus L.
*novae-angliae L.
*paniculatus Lam.
*patens Ait.
*puniceus L.
*spectabilis Ait.
*subulatus Michx.

Bidens
*cernua L.
*coronata (L.) Fisch.
*laevis (L.) BSP.

Carlina
acaulis L.

Centaurea
Fritschii Hay.

Chrysanthemum
Parthenium "Golden Ball"
Parthenium "Silver Ball"

Chrysopsis
*falcata (Pursh) Ell.
*mariana (L.) Nutt.

Cirsium
*muticum Michx.

Coreopsis
grandiflora Hogg
lanceolata L.
palmata Nutt.
pubescens Ell.

Cosmos
diversifolius Otto

Dimorphotheca
pluvialis (L.) Moench

Echinops
sphaerocephalus L.

Erigeron
macranthus Nutt.

Eupatorium
*album L.
*hyssopifolium L.
*perfoliatum L.
*pubescens Muhl.
*purpureum L.
*resinosum Torr.
*rotundifolium L.

Gaillardia
pulchella Fouq.
pulchella var. picta Gray

Gymnolomia
multiflora (Nutt.) B. & H.

Helianthus
*angustifolius L.
*divaricatus L.
*giganteus L.
sparsifolius Hort.

Helichrysum
bracteatum (Vent.) Willd.

Heliopsis
helianthoides (L.) Sweet
helianthoides var. Pitcheri-
ana Hort.
scabra var. zinniaeflora
Hort.

Iva
*oraria Bartlett

Liatris
*graminifolia (Walt.)
Willd.

*scariosa Willd.
*spicata (L.) Willd.

Mikania
*scandens (L.) Willd.

Pluchea
*camphorata (L.) DC.

Rudbeckia
laciniata L.
maxima Nutt.
speciosa Wend.
speciosa var. Sullivanti
(Boynton & Beadle)
Rob.

- Sericocarpus
 *asteroides (L.) BSP.
 *linifolius (L.) BSP.
- Silphium
 laciniatum L.
 perfoliatum L.
- Solidago
 *arguta Ait.
 *asperula Desf.
 *bicolor L.
 canadensis L.
 *Elliottii T. & G.
 *graminifolia (L.) Salisb.
 *neglecta T. & G.
 *nemoralis Ait.
 *odora Ait.
 *patula Muhl.
 *puberula Nutt.
 *sempervirens L.
 *speciosa Nutt.
 *stricta Ait.
 *tenuifolia Pursh
- Stokesia
 laevis Hill
 laevis var. alba Hort.
- Tagetes
 erecta L.
 lurida Cav.
- Vernonia
 *noveboracensis Willd.

Convolvulaceae 249

- Pharbitis
 hederacea Jacq.
 sagittata Lam.
- Quamoclit
 pinnata Bojer

Cornaceae 229

- Cornus
 *canadensis L.

Cruciferae 105

- Berteroa
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Datisceae 207

- Datisca
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Dipsacaceae 274

- Dipsacus
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Droseraceae 112

- Drosera
 *longifolia L.
 *rotundifolia L.

Ericaceae 233

- Gaultheria
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Gentianaceae 246

- Gentiana
 *crinita Froel.
 *Saponaria L.
 straminea Maxim.
- Nymphoides
 peltatum (Gmel.) Brit. &
 Rendle
- Sabatia
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Geraniaceae 129

- Geranium
 *carolinianum L.
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Hypericaceae 187

- Ascyrum
 *Stans Michx.
- Hypericum
 *adpressum Bart.
 Ascyron L.
 *ellipticum Hook.

Labiatae 254

- Dracocephalum
 nutans L.
 Hedeoma
 *pulegioides (L.) Pers.
 Monarda
 *punctata L.
 stricta Wooton
 Ocimum
 Basilicum L.
 Perilla
 frutescens Brit. var. nan-
 kinensis Bailey
 Phlomis
 alpina Pall.
 cashmeriana Royle
 Physostegia
 virginiana (L.) Benth.
 Salvia
 azurea Lam. var. grandi-
 flora Benth.
 jurissicii Kosan.
 splendens Ker-Gawl.
 Scutellaria
 angustifolia Pursh
 canescens Nutt.
 Stachys
 *hyssopifolia Michx.
 Teucrium
 Botrys L.
 Trichostema
 *dichotomum L.

Leguminosae 128

- Amphicarpa
 *monoica (L.) Ell.
 *Pitcheri T. & G.
 Baptisia
 australis (L.) R. Br.
 *tinctoria (L.) R. Br.
 Cassia
 *Chamaecrista L.
 *nictitans L.
 Clitoria
 Ternatea L.

- Desmanthus
 illinoensis MacM.
 Lathyrus
 *maritimus (L.) Bigel.
 Mimosa
 pudica L.
 Strophostyles
 *helvola (L.) Brit.
 Tephrosia
 *virginiana (L.) Pers.

Loasaceae 206

- Blumenbachia
 Hieronymi Urb.

Lobeliaceae 276a

- Lobelia
 *cardinalis L.
 *inflata L.

Lythraceae 216

- Cuphea
 lanceolata Ait.
 procumbens Cav.

Malvaceae 175

- Callirhoe
 involucrata Gray
 Hibiscus
 militaris Cav.
 Moscheutos L.
 Moscheutos Hybrids
 Trionum L.
 Kitaibelia
 vitifolia Willd.

Martyniaceae 260

- Martynia
 louisiana Mill.
 lutea Lindl.

Melastomaceae 223

- Rhexia
 *virginica L.

Nymphaeaceae 88

- Nymphaeanthus
 *advena (Ait.) Fernald

Onagraceae 224

- Clarkia
 elegans Douglas
 Epilobium
 *angustifolium L.
 Lopezia
 racemosa Cav.
 Ludwigia
 *sphaerocarpa Ell.
 Oenothera
 Drummondii Hook.
 speciosa Nutt.

Orobanchaceae 261

- Epifagus
 *virginiana (L.) Bart.

Oxalidaceae 130

- Oxalis
 corniculata L.
 stricta L.

Papaveraceae 104

- Arctomecon
 *californicum Torr. & Frem.
 *Merriami Coville
 Argemone
 Barclayana Penny
 intermedia Sweet
 ochroleuca
 Eschscholtzia
 californica Cham.

Phytolaccaceae 83

- Phytolacca
 decandra L.

Plantaginaceae 269

- Plantago
 Psyllium L.

Polemoniaceae 250

- Gilia
 achilleaeifolia Benth.
 tricolor Benth.

Polygonaceae 77

- Polygonella
 *articulata (L.) Meisn.
 Polygonum
 *scandens L.

Portulacaceae 85

- Portulaca
 grandiflora Lindl.
 marginata HBK.
 Talinum
 patens Willd.

Primulaceae 237

- Lysimachia
 *terrestris (L.) BSP.
 Steironema
 *ciliatum (L.) Raf.
 *lanccolatum (Walt.) Gray
 Trientalis
 *americana (Pers.) Pursh

Pyrolaceae 231

- Chimaphila
 *umbellata (L.) Nutt.
 Pyrola
 *elliptica Nutt.

Ranunculaceae 91

- Actaea
 *alba (L.) Mill.
 *rubra (Ait.) Willd.
 Anemone
 Halleri All.
 Aquilegia
 baikalensis Hort.
 canadensis L.

chrysantha Gray
 Skinneri Hook.
 vulgaris L.
 vulgaris var. nivea grandiflora Hort.
 vulgaris var. olympica Baker

Clematis
 ochroleuca Ait.
 *virginiana L.
 Coptis
 *groenlandica (Oeder) Fern.
 (C. trifolia of auth.)
 Paeonia
 corallina Retz.
 Thalictrum
 aquilegifolium L.
 Trollius
 *laxus Salisb.

Rosaceae 126

Geum
 japonicum Thunb.
 Gillenia
 trifoliata (L.) Moench
 Potentilla
 viscosa Don
 Sanguisorba
 *canadensis L.

Rubiaceae 270

Mitchella
 *repens L.

Sarraceniaceae 110

Sarracenia
 *purpurea L.

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Heuchera
 macrorrhiza Small
 Parnassia
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Scrophulariaceae 257

Chelone
 *glabra L.
 Gerardia
 *purpurea L.
 Gratiola
 *aurea Muhl.
 Linaria
 dalmatica Mill.
 macedonica Griseb.
 Melampyrum
 *lineare Lam.
 Pentstemon
 barbatus Nutt. var. Torreyi
 Gray
 diffusus Douglas
 glaber Pursh
 glaber var. alpinus Gray
 *hirsutus Willd.
 Rhinanthus
 *Crista-galli L.
 Scrophularia
 *nodosa L.

Solanaceae 256

Capsicum
 frutescens L.
 Nicotiana
 alata Link & Otto var.
 grandiflora Comes
 Sanderac Sander
 solanifolia Walp.
 Tabacum L.
 Solanum
 dulcamara var. nanschanicum
 Humboldtii Willd.
 sodomaeum L.

Umbelliferae 228

Cicuta
 *maculata L.
 Coriandrum
 sativum L.

Eryngium
 amethystinum L.
 Heracleum
 platytaenium Boiss.
 Osmorrhiza
 *longistylis (Torr.) DC.
 Sium
 *cicutae-folium Schrank

Verbenaceae 253

Verbena
 *hastata L.
 venosa Gill. & Hook.

Violaceae 198

Viola
 *affinis LeConte
 *conspersa Reichenb.
 *fimbriatula Sm.
 *lanceolata L.
 *latiuscula Greene
 *pallens (Banks) Brainerd
 *palmata L.
 *primulifolia L.
 *sagittata Ait.
 *striata Ait.

Zygophyllaceae 135

Tribulus
 terrestris L.

MONOCOTYLEDONES

Amaryllidaceae 340

Zephyranthes
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Araceae 323

Arisaema
 *triphyllum (L.) Schott
 Peltandra
 *virginica (L.) Kunth

Cyperaceae 320

Carex
 Grayii Carey
 *gynandra Schwein.
 Cyperus
 Houghtonii Torr.
 Eriophorum
 *virginicum L.

Eriocaulaceae 330

Eriocaulon
 *compressum Lam.
 *decangulare L.

Gramineae 319

Andropogon
 *glomeratus (Walt.) BSP.
 *scoparius Michx.
 *virginicus L.
 Glyceria
 *obtusata (Muhl.) Trin.
 Panicum
 *virgatum L.
 Phragmites
 *communis Trin.

Haemodoraceae 339

Lachnanthes
 *tinctoria (Walt.) Ell.
 Lophiola
 *aurea Ker.

Iridaceae 344

Sisyrinchium
 *angustifolium Mill.
 *atlanticum Bicknell

Juncaceae 336

- Juncus*
 *effusus L. var. solutus
 Fern. & Wieg.

Liliaceae 338

- Anianthium*
 *muscaetoxicum (Walt.)
 Gray
Asphodeline
 lutea Reichb.
Clintonia
 *borealis (Ait.) Raf.
Helonias
 *bullata L.
Lilium
 *superbum L.
Maianthemum
 *canadense Desf.
Medeola
 *virginiana L.
Oakesia
 *scssilifolia (L.) Wats.
Polygonatum
 *biflorum (Walt.) Ell.
 *commutatum (R. & S.)
 Dietr.
Smilacina
 *racemosa (L.) Desf.
 *stellata (L.) Desf.
Streptopus
 *roscus Michx.

- Trillium*
 *erectum L.
 *undulatum Willd.
Uvularia
 *perfoliata L.
Xerophyllum
 *asphodeloides (L.) Nutt.
Yucca
 filamentosa L.

Orchidaceae 350

- Calopogon*
 *pulchellus (Sw.) R. Br.
Corallorrhiza
 *maculata Raf.
Cypripedium
 *acaule Ait.
 *parviflorum Salisb.
Epipactis
 *pubescens (Willd.) A. A.
 Eaton
Habenaria
 *bracteata (Willd.) R. Br.
 *hyperborea (L.) R. Br.

Pontederiaceae 334

- Pontederia*
 *cordata L.

Xyridaceae 329

- Xyris*
 *caroliniana Walt.

SEEDS OF TREES AND SHRUBS**GYMNOSPERMAE****Pinaceae**

- Cedrus*
 Libani Loud.

ANGIOSPERMAE

Bombacaceae 177

- Ochroma
Lagopus Swartz

Fagaceae 62

- Nothofagus
†fusca Oerst.
†Menziesii Oerst.
†Solandri Oerst.
†truncata (Col.) Ckn.

Juglandaceae 60

- Platycarya
strobilacea Sieb. & Zucc.

Lauraceae 102

- Benzoin
*aestivale (L.) Nees

Leguminosae 128

- Amorpha
*fruticosa L.
Cladrastis
platycarpa Mak.

Rosaceae 126

- Spiraea
*tomentosa L.

SEEDS COLLECTED IN THE PINE BARRENS OF NEW JERSEY
BY MR. T. WINDON

- Arctostaphylos
*Uva-ursi (L.) Spreng.
Arenaria
*caroliniana Walt.
Breweria
*Pickeringii (M. A. Curtis)
Gray
Calopogon
*pulchellus (Sw.) R. Br.
Chimaphila
*maculata (L.) Pursh
Cypripedium
*acaule Ait.
Drosera
*filiformis Raf.
Epipactis
*pubescens (Willd.) A. A.
Eaton
Eriophorum
*virginicum L.
Gaultheria
*procumbens L.

- Gentiana
*Andrewsii Griseb.
*Porphyrio J. F. Gmel
Habenaria
*blephariglottis (Willd.)
Torr.
*clavellata (Michx.) Spreng.
Hudsonia
*ericoides L.
Leiophyllum
*buxifolium (Berg.) Ell.
Liatris
*spicata (L.) Willd.
Lobelia
*cardinalis L.
Lophiola
*aurea Ker.
Mitchella
*repens L.
Pogonia
*ophioglossoides (L.) Ker.
Polygala
*lutea L.

† New Zealand seeds, obtained by courtesy of the State Forest Service, Wellington, New Zealand.

Sabatia

*sp. (pink flrs.)

*lanceolata (Walt.) T. & G.

Sarracenia

*purpurea L.

Spiranthes

*cernua (L.) Richard

Xerophyllum

*asphodeloides (L.) Nutt.

Address requests for seeds before March 15 to

SEED EXCHANGE,
Brooklyn Botanic Garden,
1000 Washington Avenue,
Brooklyn, N. Y.,
U. S. A.

THE BOTANIC GARDEN AND THE CITY

THE BROOKLYN BOTANIC GARDEN, established in 1910, is a Department of the Brooklyn Institute of Arts and Sciences. It is supported in part by municipal appropriations, and in part by private funds, including income from endowment, membership dues, and special contributions. Its articulation with the City is through the Department of Parks.

The City owns the land devoted to Garden purposes, builds, lights, and heats the buildings, and keeps them in repair, and includes in its annual tax budget an appropriation for other items of maintenance. One third of the cost of the present buildings (about \$300,000) and of other permanent improvements (about \$253,000) has been met from private funds.

Appointments to all positions are made by the director of the Garden, with the approval of the Botanic Garden Governing Committee, and all authorized expenditures for maintenance are made in the name of the private organization, from funds advanced by the Institute, which, in turn, is reimbursed from time to time by the City, within the limits, and according to the terms of the annual Tax Budget appropriation.

All plants have been purchased with private funds since the Garden was established. In addition to this, it has been the practice of the Garden, from its beginning, to purchase all books for the library, all specimens for the herbarium, all lantern slides and photographic material, and numerous other items, and to pay certain salaries, with private funds.

The needs of the Garden for private funds for all purposes, are more than twice as great as the present income from endowment, membership dues, and special contributions. The director of the Garden will be glad to give full information as to possible uses of such funds to any who may be interested.

INFORMATION CONCERNING MEMBERSHIP

The Brooklyn Institute of Arts and Sciences is organized in three main departments: 1. The Department of Education. 2. The Museums. 3. The Botanic Garden.

Any of the following seven classes of membership may be taken out through the Botanic Garden:

1. Annual member	\$ 10
2. Sustaining member	25
3. Life member	500
4. Permanent member	2,500
5. Donor	10,000
6. Patron	25,000
7. Benefactor	100,000

Sustaining members are annual members with full privileges in Departments one to three. Membership in classes two to seven carries full privileges in Departments one to three.

In addition to opportunities afforded to members of the Botanic Garden for public service through coöperating in its development, and helping to further its aims to advance and diffuse a knowledge and love of plants, to help preserve our native wild flowers, and to afford additional and much needed educational advantages in Brooklyn and Greater New York, members may also enjoy the privileges indicated on the following page.

Further information concerning membership may be had by addressing The Director, Brooklyn Botanic Garden, Brooklyn, N. Y., or by personal conference by appointment. Telephone, Prospect 9-6173.

PRIVILEGES OF MEMBERSHIP

1. Free admission to the buildings and grounds at all times.
2. Cards of admission for self and friends to all exhibitions and openings preceding the admission of the general public, and to receptions.
3. Services of docent (by appointment), for self and party (of not less than six), when visiting the Garden.
4. Admission of member and his or her immediate family to all lectures, field trips, and other scientific meetings under Garden auspices, at the Garden or elsewhere.
5. Free tuition in most courses of instruction; in other courses members are allowed a liberal discount from the fee charged to non-members.
6. Invitations for self and friends to spring and fall "Flower Days."
7. Copies of Garden publications, as follows:
 - a.* Record.
 - b.* Guides.
 - c.* Leaflets.
 - d.* Contributions.
8. Frequent Announcement Cards concerning plants in flower and other exhibits.
9. Privileges of the Library and Herbarium.
10. Expert advice on the choice and care of ornamental trees, shrubs, and herbaceous plants, indoors and out, on planting the home grounds, the care of lawns, and the treatment of plants affected by insect and fungous pests.
11. Determination of botanical specimens.
12. Participation in the periodical distribution of surplus plant material and seeds, in accordance with special announcements sent to members from time to time.

FORMS OF BEQUEST TO THE BROOKLYN BOTANIC GARDEN

Form of Bequest for General Purposes

I hereby give, devise, and bequeath to The Brooklyn Institute of Arts and Sciences, Brooklyn, N. Y., the sum of.....Dollars, the income from which said sum to be used for the educational and scientific work of the Brooklyn Botanic Garden.

Form of Bequest for a Curatorship

I hereby give, devise, and bequeath to The Brooklyn Institute of Arts and Sciences, Brooklyn, N. Y., the sum of.....Dollars, as an endowment for a curatorship in the Brooklyn Botanic Garden, the income from which sum to be used each year towards the payment of the salary of a curator in said Botanic Garden, to be known as the (here may be inserted the name of the donor or other person) curatorship.

Form of Bequest for a Fellowship

I hereby give, devise, and bequeath to The Brooklyn Institute of Arts and Sciences, Brooklyn, N. Y., the sum of.....Dollars, the income from which sum to be used in the payment of a fellowship for advanced botanical investigation in the Brooklyn Botanic Garden, to be known as thefellowship.

Form of Bequest for other particular purposes designated by the testator

I hereby give, devise, and bequeath to The Brooklyn Institute of Arts and Sciences, Brooklyn, N. Y., the sum of.....Dollars, to be used (or the income from which to be used) for the Brooklyn Botanic Garden *

* The following additional purposes are suggested for which endowment is needed:

1. Botanical research.
2. Publishing the results of botanical investigations.
3. Popular botanical publication.
4. The endowment of a lectureship, or a lecture course.
5. Botanical illustrations for publications and lectures.
6. The purchase and collecting of plants.
7. The beautifying of the grounds.
8. The purchase of publications for the library.
9. Extending and enriching our work of public education.
10. The establishing of prizes to be awarded by the Brooklyn Botanic Garden for botanical research, or for superior excellence of botanical work in the High Schools of the City of New York.



FIG. 1 North Addition. Perspective of the landscape architect's plan for the development of this area as a Horticultural Section (8558)

BROOKLYN BOTANIC GARDEN RECORD

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APRIL, 1934

NO. 2

TWENTY-THIRD ANNUAL REPORT OF THE BROOKLYN BOTANIC GARDEN 1933

REPORT OF THE DIRECTOR

TO THE BOTANIC GARDEN GOVERNING COMMITTEE:

I have the honor to present the following report for the year 1933.

LONG VIEWS AND SHORT VIEWS

"The cycles of trade depression which afflict the world," says Whithead, "warn us that business relations are infected through and through with the disease of short-sighted motives."

Success in business means attainment; the reward of effort is apt to be not so much the joy of endeavor, but the thing attained. The main ideal is near enough at hand to be realized. This is why so many writers have appraised the business man as short-sighted.

Thus Galsworthy: "Our modern castle in Spain is, in one word: 'Production' . . . we are not fortunate enough in civic life to have leaders who were born seeing two inches before their noses. . . . Our civilization, if it is to endure, must have a star on which to fix its eyes—something distant and magnetic to draw it on beyond the troubled needs and prejudices of the moment."

And then he refers to the builders of Seville Cathedral, who said, "Let us build a church so great that those who come after us may think us mad to have attempted it." To complete the church took 150 years.

Undoubtedly Galsworthy's "two inches" are an unjust exaggeration. Many business men are idealists. The world is dotted with scientific, educational, and charitable institutions which are monuments to business men of that type—James Smithson, Stephen Girard, Peter Cooper, Matthew Vassar, Ezra Cornell, Cecil Rhodes, Andrew Bernhard Nobel, Andrew Carnegie, Marshall Field, Edwin Gould, Alfred T. White, not to mention those still living. These names are recalled only as outstanding types of a class. Other business men have invested in securities, but have lacked the long vision which enabled them to see that the greatest safety, the largest returns, and the deepest satisfactions of life are to be had by investing in those institutions which yield returns to others and contribute to the advancement of science and art, education, and civilization.

A Botanic Garden is such an institution. Whatever measure of success may have attended the efforts of this one, is recorded in the twenty-two Annual Reports that have preceded. The importance of the "long view" as well as the large view has already been emphasized in some of these reports. It needs to be kept constantly in mind and to be restated from time to time. Why should the builders of a botanic garden be less ambitious than the builders of the Seville Cathedral? We have not half realized what it would mean to Brooklyn, to civic advancement in general, to education and science and art, to develop our fifty acres of plantations to such a perfection of beauty, and our scientific and educational program to such high standards of accomplishment "that those who come after us may think us mad to have attempted it." What a wonderful and unusual opportunity is here presented for private philanthropy.

We must not lose sight of the substantial accomplishment of the past twenty-three years; to do so would spell discouragement. We do not fail to remember generous benefactions and the sustained and active interest and the moral support which have accompanied them; to do that would be most ungenerous and forgetful. But, what is still more important, we must not be unmindful of what has not been accomplished, of how far short we have come of the ideal of accomplishment; to do this would be to lose a most effective stimulus to continued endeavor.

The short view reveals an institution of modest means, limited area, and limited possibilities. The danger consists in considering the *status quo* as final, and the needs *therefore* correspondingly small.

The long view reveals the ideal of an institution to be realized by gradual, steady progress. Not such an ideal that our *contemporaries* will think us mad to attempt it, but such an ideal as will stimulate united endeavor to approach it as rapidly as possible, and will compel the approval, as well as the commendation, of those who come after us.

Nothing could be more disastrous to an institution than to adopt the attitude, held, alas, by some, that needs are determined by size—that because it is small its requirements must eternally be small. To do this is to be indifferent to the essential element of quality—to see two inches before one's nose, rather than to visualize an ideal.

DEPRESSION AND MORALE

Social workers and those engaged in relief work during the depression have reported that food and fuel and wherewithal to be clothed are not the only urgent needs of the unemployed. The depression is not only economic; it tends to become mental and spiritual. Loss of morale needs to be steadily counteracted; it tends to persist and to result in permanent social maladjustment. The results are disastrous in proportion to one's lack of intellectual and cultural resources. While music and art, literature and science, cannot appease hunger, they do minister to fundamental human needs, and their ministrations become increasingly urgent in adversity.

It is specially important, therefore, in periods of unemployment and depression that institutions which meet these needs should not be forced to retrench their activities too greatly. That nearly one hundred and ten thousand persons have come to the Brooklyn Botanic Garden every month during 1933 to enjoy and study the collections, to use its library, to attend its classes and lectures, bears testimony to the fact that the Garden is meeting fundamental human needs, aesthetic, intellectual, and cultural, on a scale that is truly impressive. Of course, it cannot continue to do this adequately with diminished appropriations and contributions.

A writer in the *Survey Graphic* for December, 1933, has described how one family has met the depression. With a reduction in salary of 80 per cent. (from \$100 to \$20 a week), he writes, "No victim of the present conditions need be mentally depressed so long as he has access to books, and a garden to work in. What is more satisfying, more soul inspiring, than to prepare the soil, plant the seed, and watch the unfolding of leaf and bud."

But one cannot become genuinely interested in gardening without becoming interested in gardens and in plants. The inspection of other gardens gives one suggestions to apply in his own. It may, indeed, if he only follows the leads, take him to books and ideas concerning the history of gardening; and along that thread he may follow the fascinating story of civilization from its dawn to the present.

A more or less superficial and sketchy knowledge of plants no longer suffices; one feels the need of knowing a larger number of kinds—trees, shrubs, and herbaceous plants, and, in many cases, one finds himself wanting to know their horticultural or botanical as well as their common names, something of their relationships—the plant family to which they belong—the country of their origin, and the cultural conditions they require. If a botanic garden is accessible, it is easy to gratify these interests, and to deepen and broaden them. This, in fact, is one of the services which the Brooklyn Botanic Garden renders to its community. And not only to those in its more immediate community, but to those within commuting distance. Thus we find ourselves a center of interest and pilgrimage and correspondence with an ever increasing number from all of Long Island, from every borough of Greater New York, from Westchester County, and from suburban New Jersey—including persons who, particularly in this period of economic depression, have turned instinctively to gardening and plant life and found themselves not disappointed.

NON ACTA SED AGENDA

It will, perhaps, seem to the readers of this report that its first paragraphs should record the fact that, even in a period of universal economic disaster, some progress has been made. It would be easy to do this; but the future welfare of an institution is pro-

moted, not by dwelling with smug satisfaction on what has been accomplished, but on what remains to be accomplished—on what *ought* to be done. Moreover, the only safe satisfaction of an executive is not in past achievements, but in plans for the future and in the very process of bringing things to pass. The following pages will contain the record of progress for the year 1933. If it is presented in such a way as to produce in the minds of officials and contributors a feeling of satisfaction, instead of incentive and inspiration, it will have wholly failed in its purpose.

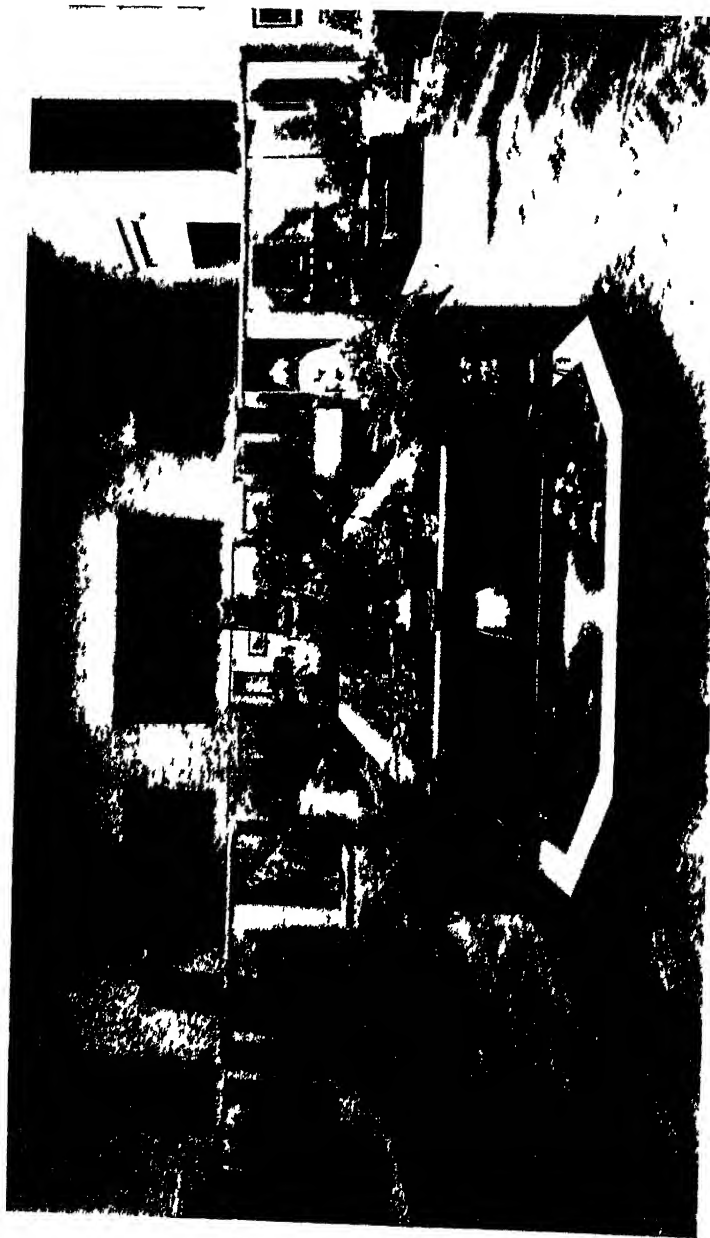
A WORD OF APPRECIATION

This report should not proceed far without recording the very genuine appreciation of the director and staff of all that has been done and contributed of time, effort, enthusiasm, interest, and money to carry the Garden over a period of stress and strain—to save it from suffering as much as it might easily have suffered during the collapse of the economic set-up of the world, to ease and thereby to share the burdens of administration. This appreciation finds its most substantial expression in the fact that the staff itself, in common with the staffs of other similar institutions, has accepted reductions in personal salary and departmental budgets without complaint and with no diminution of loyalty to the Garden.

The president of the Board and the chairman and members of the Governing Committee have given every possible evidence of confidence and moral support.

THE WOMAN'S AUXILIARY

No institution ever had a more active or enthusiastic body of supporters than the Botanic Garden has in its Woman's Auxiliary. Its chairman and every other officer and member have spared neither time nor effort to help save the Garden from defeat by the discouragement of adverse circumstances during the past two years. As a result of these efforts, the circle of friends intelligently interested in the Garden has been greatly extended, the net loss of Garden membership has been greatly reduced, and the raising by subscription from the small Auxiliary membership of the sum of more than \$1500, and by a public lecture of \$735.00



F. G. 2. Exhibition of plant forms in ornament, at the Metropolitan Museum of Art, New York City (Metropolitan Museum negative MM6363g)

for unemployment relief at the Garden was in reality a triumph of optimism and persistence, especially at a time when every one was being deluged with appeals for contributions to very worthy causes. We expect hospitals and economic distress to make a compelling appeal (as they should), but to appreciate the civic and cultural importance of the activities of a botanic garden and to rise to the occasion with the zeal of this Auxiliary is to reach a new level of understanding of what things are important in a civilization like ours.

And last, but by no means least, I wish to record here, on behalf of the director and staff, an appreciation which is beyond all words of adequate expression, for the more than generous contributions of funds by three staunch friends. Without these contributions, it would have been necessary to suspend indefinitely a large and important part of our work. The contributions were made possible only by definite personal economies, and this fact is not lost sight of. Our only regret is that these benefactors wish to remain anonymous.

THE WORK BEFORE US

And now, to use a Hibernianism, let us postpone the past for another page or two, and try to get an outline of the picture which lures us on.

Entrance Gates.—Is it not really a cause for concern that an institution 23 years of age has a suitable gate at only one of its five main entrances? We all know why. It is through no fault of the Botanic Garden authorities. But should not this situation now become a matter of active consideration? These gates are among the permanent improvements which we may properly look to the City to finance. They also afford attractive opportunities for private benefactions. The architect's designs for them were published in the BOTANIC GARDEN RECORD for May, 1930. Since that publication appeared, one of the gates—the *Richard Young Gate* (at Flatbush Ave. and Empire Boulevard)—has been built, as a gift from Mr. Young. The director will be glad to give full information concerning the other gates to anyone who may be interested. The appeal here is not only to an interest in the Botanic Garden, but to an interest in making Brooklyn a more beautiful borough.

The North Addition.—This tract of nearly four acres of land at the north end of the Garden, between Brooklyn Museum and Mt. Prospect Reservoir, has a frontage on Eastern Parkway. The Eastern Parkway gate will become the main entrance to the Garden as soon as it is built. The design for landscaping the North Addition has been prepared by Mr. Caparn, and is shown in perspective as the frontispiece of this Report. The plans were approved by the Art Commission of the City of New York and the contract was advertised for public letting. Bids were opened on September 22, 1932, but the lowest bid was \$975.50 in excess of the amount appropriated by the City. Before the matter could be adjusted, it became necessary for the City to cancel all appropriations for permanent improvements for which contracts had not been let.

Appeal to CWA.—In December, 1933, application was made to the Federal Civil Works Administration (CWA) for funds for this purpose. Preliminary approval was given before the end of the year, and it is anticipated that work on this improvement will begin early in 1934.* Plans for the three entrance gates were also laid before the CWA.

Maintenance of Grounds.—The history of public parks and gardens in the United States has, in general, been characterized by fairly generous provision of land and quite inadequate provision for proper maintenance. The latter is due to a number of factors, but the underlying cause is the lack of sufficiently high ideals of maintenance, or a willing subordination of such ideals to other, and often unworthy, considerations. For any close approximation to perfection of maintenance one must look to private estates. But, if due allowance be made for the wear and tear by hundreds of thousands of visitors a month, there is no valid reason why a public garden may not be kept in as perfect a state of maintenance as a private one. In fact, there is every reason why it should be.

"Yes," is the prompt reply, "but this requires money."

"True," is the answer, "but the fundamental need is the wish,

* Since the above report was written, the North Addition project has been approved and funds provided by the CWA. Work began on February 5 with 15 men under the supervision of Mr. Caparn. There was then about one foot of snow on the ground and the soil was frozen to the depth of six or eight inches.

and the will, and the proper ideals on the part of those responsible for providing the funds."

Doubtless, a small garden, other things being equal, does need a smaller sum for maintenance than a large garden. But the actual amount required depends upon the standard of perfection adopted. This is a truism; but it is one of the truisms that is not in danger of being stated too often.

Perhaps it will not seem pleonastic to emphasize again in this report—as was done in the last one—the valuable public service the Brooklyn Botanic Garden could render by maintaining its grounds at the standard of perfection of some of our beautiful private estates. To do this would really not require excessive nor extravagant annual appropriations. The ideal has not been wanting on the part of the administration, but the appropriations so far have been quite inadequate for a very close approximation to this ideal, although newspaper editorials have referred to the Garden as the most beautiful spot in Greater New York.

It requires no argument to make it clear that five gardeners are quite inadequate to maintain properly more than 40 acres, not of park, but of intensively planted garden, including highly specialized collections such as the rock garden, rose garden, local flora and general systematic sections, Japanese garden, and other collections requiring expert knowledge and experience. Unskilled per diem labor is not adequate for such work.

Scientific and Educational Work.—"For the advancement of botanical science and knowledge, and for the prosecution of original researches therein and in kindred subjects." This is the real object for which the Brooklyn Botanic Garden was founded, as stated in the Act of the State Legislature authorizing its establishment. It is to assist in the realization of this aim that the grounds are laid out and maintained as a "botanic garden." It is a scientific and educational institution, not merely a fifty-acre park, which has been committed to our care. For an effective program of education and research, we are quite under-financed. Without endeavoring to record all the facts in support of this statement we may note that, for example, we now have one curator less than we had four years ago. And yet there is urgent need of the services of at least two more curators, together with curatorial as-

sistants, to provide for a more efficient administration of our collections for educational ends, and for scientific investigation and the work of public instruction.

The normal, rapid expansion of our work during the past few years, and the steadily increasing demands for public service are the most convincing evidence of our need for a larger personnel and income.

There are indications that we have seen the worst of the world-wide economic depression, and we should be ready with plans to take prompt and full advantage of every opportunity that will arise during the progress of recovery, looking toward an ever-widening and more efficient public service.

PUBLIC RELATIONS

Attendance.—"Is this a bread line?", a gentleman asked. He was referring to the double queue (two abreast) extending one Sunday morning in May for about 25 feet out onto the sidewalk from the entrance turnstile of the Richard Young Gate. "No," was the reply, "these people have come to enjoy the plantations of the Brooklyn Botanic Garden." The double line continued for fully two hours, new arrivals taking their place at the end as fast as those in front could pass through the turnstile. There was a similar queue at the north Washington Avenue gate. The total attendance that Sunday was nearly 30,000. Similar queues formed on several pleasant Sundays in the spring and fall.

The total attendance for 1933 was 1,315,847 as compared to 1,307,964 in 1932 and 1,107,039 in 1931.

Mere Figures Not Interesting.—But the Botanic Garden is not interested in crowds *per se*. What we are interested in is to have the Garden used for the purposes for which it was established, namely, to stimulate and to gratify an interest in plant life—to promote public education in all aspects of botany and horticulture. The plantations are intended to serve as an outdoor museum; their use as a playground (for children or adults), and their use merely as a public park, tends to defeat their use as a botanic garden and is not encouraged. A park of several hundred acres, intended primarily for recreation, is available just across the street from the Botanic Garden, so that there is no necessity or excuse for the use

of the Botanic Garden merely as a park or playground. Our restriction, so far as possible, of the use of our plantations for botanic garden ends is appreciated by thousands who come here for that purpose.

Bureau of Public Information.—This service has now become world-wide. Requests are continually being received for information on all aspects of plant life and horticulture—technical, economic, and popular—from individuals, institutions, corporations, and national governments. The service is not wholly a one-sided one, for these contacts frequently result in the enrichment of our library, herbarium, or collections of living plants. Much of the time of the library staff is absorbed in supplying citations to literature and other information, but all departments are involved, especially the horticulturist and members of the department of plants. The horticulturist reports (p. 92) that during 1933 he has received and answered 746 requests for information, involving the writing of 242 letters in addition to replies given in person and by telephone. (Cf. p. 102.) The library replied to more than 500 requests. (On conservative estimate the Garden received and answered during the year not less than 1,500 inquiries.

RESEARCH

It is a fact that, in times of financial stress, appropriations for research are apt to be the first to be reduced. Lack of knowledge is one of the major causes of the world's ills, but when the world goes on the rocks of financial disaster, it helps to economize by withdrawing support from those activities whose object is the increase of knowledge and the spread of enlightenment. In more than one country during the past two or three years, appropriations for research have been the first to be reduced or have been reduced most drastically. How few people realize that from the dawn of civilization to the present year, scientific research has, at every step of the way, been one of the driving forces of progress.

Not a person living passes a day of his life without becoming a debtor to botanical research.

But the results of research have not only been knowledge. The application of that knowledge has been the foundation of wealth; the lack of it, economic distress. The American Chemical Society

has recently made public a statement of Dr. Mehring, of the U. S. Department of Agriculture, that, if research in the control of plant diseases should cease, the United States would be facing famine within ten years or less. *Science Service* recently noted that, "Taxes on farm products, heavier than any legislative body would even dare levy, are assessed every year by plant diseases." The principal diseases of Indian corn caused a loss of 10.3 per cent. of the crop (2,839,959,000 bushels) in 1928; 8.5 per cent. in 1929; 7.6 per cent. in 1930. Cotton diseases caused a loss of more than 17 per cent. of the crop (14,373,000 bales) in 1928. Wheat, the third big-money crop when prices are normal, was taxed by its main fungus enemies to the extent of 7.8, 8.2, and 5.7 per cent., respectively, of its total yields during the three-year period. The loss ran between eight and nine hundred millions of bushels. Great as they were, these losses would have been much larger were it not for the practical application of the results of research in plant pathology. An article in the *Scientific Monthly* for October, 1933, records the fact that during the past 19 years the life of telephone poles has been doubled by applying the results of timber disease studies, and that the loss from decay of fruits and vegetables in transit has been reduced from \$96,000,000 in 1921 and \$48,000,000 (in round figures) in 1922 to less than \$26,000,000 in 1931. In other words, the saving of loss in this one item alone, of fruits and vegetables in transit, \$22,000,000 from 1922 to 1931, is more than one third the total amount (\$60,000,000) that may be withdrawn from the United States Treasury by the entire Federal Department of Agriculture during 1934, as announced June 19, 1933; it is more than four times the total appropriation for the U. S. Bureau of Plant Industry (\$5,839,000) for 1932, which has been reduced to \$3,728,000 (withdrawal figure) for 1934. If these savings could become available for the various governmental and private agencies engaged in plant disease research, it would not be necessary to abandon important projects, in which hundreds of thousands of dollars have already been invested for equipment and operation, and to add those engaged in this research to the crowded ranks of the unemployed. But, obviously, we are not living in Utopia. The statistics here cited also emphasize the fact that, notwithstanding the numerous existing

research organizations and foundations, there is still very inadequate financial provision for botanical research.

The year's activity in the modest program of research at the Brooklyn Botanic Garden is briefly recorded on pages 54-75. As is commonly the case in research, the work already accomplished has not only extended our knowledge, but has uncovered important new problems to be solved.

This work is still on the insecure financial basis of annual contributions of funds. In a previous report (for 1930) we commented on the expressed opinion of a well-known philanthropist to the effect that each generation should be expected to provide the funds for the educational and scientific work of its own day. But when we see a great national government (the United States) cancelling ten millions of dollars of appropriations for scientific research, thus throwing hundreds of efficient scientific men out of employment, with the consequent lying idle of expensive plant and equipment and the abandonment of important projects, and, at the same time, appropriating hundreds of millions of dollars for projects undertaken primarily to give employment; and when we think what the result would be if our endowed institutions for research in medicine, chemistry, physics, biology, and other branches of science were *now* dependent on the contributions of their generous, but more or less impoverished, contemporaries, we realize, as we could hardly have done four years ago, how essential it is for the indispensable work of research and education to be made secure by permanent endowment funds.

It was the hope and the expressed anticipation of Mr. Alfred T. White, when he provided for the first research curatorship at the Botanic Garden for a limited term of years, that the work would ultimately be permanently provided for by an endowment by one of the existing foundations. As yet, however, this hope has not been fulfilled.

Registered Investigators are listed on page 63, together with statements of their problems. Part of these investigators are registered in various universities as candidates for an advanced degree, while others have attained the doctorate or the master's degree.



FIG. 3. International Flower Show. Exhibit of Brooklyn Botanic Garden, 1933. Illustrating methods of plant propagation. General view. Gold medal award of Garden Club of America. Cf. Fig. 4. (Herbert Photos, 1738-1.)

COOPERATION WITH OTHER INSTITUTIONS AND ORGANIZATIONS

In the Annual Report for 1925 we published a list of 840 institutions with which this Garden was in active cooperation that year. The number has not diminished. The following for 1933 are mentioned to illustrate the variety and scope of this cooperation:

1. *Metropolitan Museum of Art*.—On May 8, the Metropolitan Museum of Art opened a special exhibit to illustrate the use of plants as sources of design, the Brooklyn Botanic Garden, the New York Botanical Garden, the New York Public Library, and the New York Aquarium cooperating. This proved to be an interesting and instructive exhibit, but it entailed a very great amount of work. As the horticulturist has reported, the Brooklyn Botanic Garden sent growing plants weekly or oftener to the total number of 570, besides 41 bunches of cut flowers and branches.

In connection with the exhibit, the Museum held, from June 1 to 30, an exhibition of the work of students in New York High Schools and Schools of Design, with studies based upon plant forms. Considerable use was made of the Botanic Garden plantations and library by art students in preparation for this exhibit. The main exhibit continued open until September 10. The estimated attendance was 90,000.

The Merchants' Association of New York.—Since 1922 the director has been a member of the Committee on Plant Quarantines and Their Administration, and on September 26, 1933, accepted the chairmanship of the Committee, succeeding Mr. John H. Love, the first chairman, who resigned. This Committee, organized in 1922, is concerned primarily with the interests of commercial horticulturists—growers, importers, wholesalers, and retailers—as affected by the administration of the Federal Plant Quarantine Law, known as Quarantine 37.

Horticultural Society of New York.—Since 1928, the director of the Garden has served as a member of the board of directors of the Horticultural Society of New York.

During the year Dr. Svenson, of the Garden staff, gave a course of instruction, consisting of twelve sessions, under the auspices of the Society, and on November 13 commenced a repetition of this course. These courses have been largely attended and very popular.

The Garden has kept the Wardian case in the library of the Society supplied with potted plants, and has made three exhibits at the monthly meetings of the Society, as reported by the Horticulturist on page 92.

The International Flower Show is held each year in March in the Grand Central Palace, under the joint auspices of the Horticultural Society of New York and The New York Florists Club. Since 1932, the director of the Garden has been one of the Society's representatives on the Flower Show Committee.

Special attention is directed to the Horticulturist's report of our two exhibits at the 1933 show (March 20-25), for one of which, illustrating nearly every known method of plant propagation, we received the Gold Medal of the Garden Club of America, and for the other, an exhibit of about forty species and varieties of Crocus, we received a silver medal. The exhibits were planned and prepared by our Horticulturist, Mr. Free, and were installed under his supervision. The *Bulletin* of the Garden Club of America commented on the main exhibit as follows:

"The Brooklyn Botanic Garden's 'Methods of Plant Propagation' was the outstanding exhibit of the 1933 show. For inspiration and true horticultural interest nothing could touch it, and it thrilled everyone who saw it, from the horticulturist to the wondering city-dweller who knew little of the processes of plants. The gold medal of the Garden Club of America was awarded quickly and unanimously to this outstanding exhibit."

The *Gardeners' Chronicle of America*, for May, 1933, carried an article on the Flower Show which contained the following paragraph:

"I have been asked to mention a few features. . . . First, to my mind, comes the propagating exhibition as a basis of all gardening efforts, displayed by the Brooklyn Botanic Garden. It was something more than stimulating knowledge and interest; it also demonstrated thoroughly that a botanical garden can be intensely practical as well as entertaining."

The following quotations are from two of the many letters of commendation received:

"Made a vivid impression on everyone . . . outstanding, comprehensive, and educational."

"It was the finest and most informative exhibit of its kind I have ever seen, and you certainly deserve the profound thanks of the many people who are interested in this subject."

Concerning the Crocus exhibit, the firm of J. J. Grullemans & Sons, Bulb Growers, Lisse, Holland, commented as follows: "Your exhibit of crocus species was very attractive. We have never seen anything like this in America."

Our exhibit was crowded with visitors daily throughout the entire week. The total attendance at the Flower Show was approximately 130,000. The majority of these viewed the Brooklyn Botanic Garden exhibits. Members of our Woman's Auxiliary rendered invaluable service by being in daily attendance at the booth. Newspaper clippings have been received of 41 news items concerning this exhibit. It also received generous mention in various horticultural publications.

American Iris Society.—Cooperation with this Society, begun in 1920, in the test garden for Japanese Iris, has continued during 1933. The Iris project is in charge of Dr. George M. Reed, curator of plant pathology.

Century of Progress Exposition (Chicago).—The director of the Garden was a member of the sub-committee on science exhibits of this Exposition, and during the summer the Garden exhibited in the Horticultural Section a set of 85 paintings from its growing collection of water-color illustrations of Iris, made by Miss Maud Purdy and Miss Louise Mansfield, Botanic Garden artists, in connection with our Iris projects.

United States Government.—Steps are being taken in Washington to reorganize and relocate the United States Botanic Garden, and during the year, by request, the director has been in consultation with a representative of Congress on this matter.

Sixth International Congress of Genetics.—This Congress was held in Ithaca, N. Y., in the summer of 1932. The publication of the *Proceedings* of the Congress was in charge of the business management of *Genetics*, which is published by the Garden. Volume II of the *Proceedings* was issued at the time of the Congress, and Volume I appeared during 1933.

American Nature Study Society.—Our curator of elementary instruction, Miss Ellen Eddy Shaw, has been a director of this

Society during the year. At the annual meeting in Cambridge, Mass., December 26-30, papers were given by the director on aspects of adult education, and by Miss Jenkins, instructor, on "By-products of a Children's Garden," based on the work in our own Garden.

Miscellaneous.—As in preceding years, there has been almost continuous cooperation throughout the year with other botanic gardens, numerous garden clubs, various colleges and universities, city departments, the public and high schools of this and other cities, and private commercial concerns.

Cooperation has also continued for the 20th year with the Botanical Society of America in the publication of *American Journal of Botany*, now in its 20th volume; the Ecological Society of America for the 14th year in the publication of *Ecology*, now in its 14th volume; and with the Editorial Board of Genetics, for the 15th year, in the publication of *Genetics*, now in its 19th volume. Reports on these journals may be found in Appendix 8, page 152.

The Commission on International Justice and Goodwill of the Brooklyn Church and Mission Federation, holds annual exercises on Memorial Day in honor of some "Peace Hero." This year (May 30), the hero chosen was Mr. Alfred T. White, the "father" of the Garden. Rain made it necessary to transfer the exercises from the Alfred T. White Memorial Tablet, on the shore of the lake, to the rotunda of the Laboratory Building. The Rev. John C. Walker, minister of the Congregational Church of the Pilgrims, was chairman, and the speakers were the Rev. I. Bradford Young, assistant rector of Holy Trinity Protestant Episcopal Church, who placed a wreath in memory of Mr. White; Mr. Guy Du Val, a business associate of Mr. White and member of the Garden; Mrs. Henry A. Ingraham, president of the Brooklyn Y. W. C. A., and a member of our Woman's Auxiliary; and Rev. Edward J. Manning, assistant minister of the Unitarian Church of the Saviour, of which Mr. White was a member.

Cooperation with Relief Agencies

During 1933, the Emergency Work and Relief Bureau of the Emergency Unemployment Relief Committee placed a total of 54

unemployed men and women at the Garden. Of these, 22 were women, as many as 19 being employed at one time in the library, herbarium, photographic department, business office, and seed-room, and at stenographic and other work.

Of the men, five had "inside" work, drafting, janitorial assistance, and herbarium and library work, including repair of bindings, and translating.

Of 27 men having "outside" work, six were placed directly by the Work Bureau, and 21 by the Brooklyn Bureau of Charities, but the wages of the latter were paid from Emergency Unemployment Relief funds. In addition, there were 23 men placed and paid directly by the Bureau of Charities. One man was placed for three months by the Association for Improving the Condition of the Poor. This makes a total of 78 unemployed men and women placed at the Garden by all agencies during the year.

Citizens Family Welfare Committee.—On December 13, Mr. Paul Franklin, representing this Committee, presented before our entire personnel their plan for contributions by employees of the City educational institutions. As a result 39 persons pledged one per cent. or more of their salaries for three months as a contribution to the relief fund. These contributions will be received and transmitted to the Welfare Committee by our Business Office. The total amount pledged was \$262.51.

PUBLIC EDUCATION

Education for All.—In ancient Greece and Rome the leisure of cultivated men was made possible by the labor of slaves. In our times, leisure for the masses is made possible by the labor of machine tools. Our problem is to encourage the right use of this leisure time to the end that a larger and larger percentage of the masses may approach the ideal of cultivated men and women. Culture is not a product of elementary education, nor even a necessary product of the colleges, although the foundation may, in part, be laid there; it results (though not always) from the spontaneous and sustained process of adult education. For the most part it begins when the formal pedagogy of the schools ends. It is encouraged and aided by such institutions as our museums and botanic gardens, with their exhibits and the lectures, docentry, and

more formal instruction based upon and correlated with those exhibits. Like the schools, these institutions minister to juvenile and adolescent education, but they differ from the schools in their emphasis on what has come to be called "adult education."

The educational program of the Brooklyn Botanic Garden provides for all three classes—juveniles, adolescents, and adults—its adopted standard being, *anything scientific or educational based upon plant life.*

The Challenge of Leisure.—There are 144 hours in the six working days of every week. It is scarcely a generation ago that the hours of labor for persons gainfully employed were 72 hours a week, or one half the total number. The eight-hour day meant 48 hours of work per week. On the basis of the NRA Codes, the hours of labor have been reduced to 35 a week, leaving 48 hours (not including Sundays) for sleep, and 61 hours a week, or more than ten hours a day, for meals and—for what? Conceivably one might loaf or play for ten hours a day, but, fortunately, few human beings are so constituted that such a program makes any appeal. Every normal person prefers to be profitably occupied. A certain amount of idleness may be profitable and physiologically beneficial, but the new hours for labor make the old problem of the best use of leisure more urgent than ever before.

This fact has now had national recognition, and Mr. Grover Whalen, as chairman of the President's Emergency Re-employment Committee for the City of New York, in 1933, appointed a special sub-committee to consider what the City might do as a community to promote the best use of the new hours of leisure. Schools of all grades, museums, botanic gardens, churches, and various other agencies of adult education already afford a large opportunity, but the work can still be expanded and improved. In particular, many, coming for the first time into hours of leisure beyond the needs of recuperative recreation, need to have their attention directed to these opportunities for profitable as well as pleasurable use of time, and their interest in them aroused and deepened.

When Aristotle, two thousand years ago, said that the main purpose of education was the right use of leisure, only the wealthy few had leisure; now, apparently, the great mass of the people

are coming into this inheritance. We all know that the word *school* is derived from a Greek word meaning *leisure*; the relationship may now be reversed so that leisure may come to mean school for many hitherto deprived of that opportunity. Said the former Secretary of War, Newton D. Baker, to the Banff Conference of the Institute of Pacific Relations, in 1933, "The only hope of mankind, where adult knowledge is a factor of public opinion, is a continuous process of education." To this work the Brooklyn Botanic Garden aims to make as large a contribution as its facilities and resources will permit.

The Social Need of Scientific Thinking.—"It is not to deny that one of the reasons of the incapability of the nations to deal successfully with the disastrous consequences of the world crisis is the insufficient development of social sciences in comparison with that of natural sciences, and the feeble penetration of scientific thinking into the broad masses of population."

The quotation is from the "Greeting" from the Lithuanian University of Vytautas the Great to New York University on the occasion of its conference on The Obligation of Universities to the Social Order, in 1933.

It would, perhaps, not be an extreme statement to say that the present economic crisis is due in large part to the fact that men of big business and men in public office, as well as the much maligned "man in the street," have been thinking commercially, or myopically, or politically, or wishfully—almost any way except scientifically, and have been acting accordingly, or even quite thoughtlessly, except for the matter immediately in hand.

Herein is the strongest justification for science in a program of public education—its ability to teach, not only information about nature, but a *way of thought* which must become a habit of thought if civilization is to advance. This is the essence of science, and no scientific institution such as this botanic garden, no school or university, can render a more valuable or more needed service than to provide such a program of public education as will diffuse a knowledge of scientific method; this it is which should permeate all elementary and adult instruction until it becomes a habit of mind. The program of public education at the Brooklyn Botanic Garden is organized with the aim of making some contribution, however small, to this result.

Statistics.—Eighteen courses for adults and nine for children of high school age or younger were listed in the 1933-34 *Prospectus*. The total enrollment in all courses was 1,455 (Adults, 817; Children, 638).

The number of class exercises, lectures, addresses, and informal talks for the year reached a total of 1684, as follows:

1. Sessions of regular classes	639
2. Sessions of visiting classes from schools	677
3. Lectures to adults at the Garden	51
4. Lectures to elementary and high school pupils	446
5. Addresses at schools and clubs (extra mural)	75
6. Radio talks broadcast	27
	<hr/>
	1915
Less duplication (lines 2 and 4)	231
	<hr/>
Net total	1684

Docentry.—During the year, 42 garden clubs and other groups have had the services of a teaching guide (docent) by request, in addition to the regular, scheduled work of this nature.

Exhibits.—Twenty-one exhibits were installed during the year, not including those at the Garden in connection with the various Flower Days. The estimated total attendance has been more than 550,000, not counting the visitors to the Brooklyn Botanic Garden exhibit at the Chicago Century of Progress Exposition. Details of these exhibits are given on pages 92, 100, and 105.

Educational Tablets.—In the preceding report, we acknowledged the generous gift of \$50, on December 17, 1932, to provide a bronze tablet giving brief geological information about "Boulder Hill" in the Garden. On February 8, 1933, this tablet was placed on a large glacial boulder at the foot of the Hill. The inscription reads as follows:

"Boulder Hill and the entire northern portion of the Botanic Garden are part of the terminal glacial moraine extending from The Narrows to Montauk Point. This tablet was given in 1932 by the Boys and Girls Club of the Brooklyn Botanic Garden."

Broadcasting.—More radio talks have been given this year than ever before. These have been given—27 in all—by Mr. Free, Dr. Graves, Miss Shaw, and Miss Jenkins. Their titles and the stations are given on page 148.

Newspaper Publicity.—The sending of periodic news releases to about 25 newspapers and 5 magazines concerning floral displays, educational work and related matters has continued as in past years by Dr. Graves as a regular activity of the Department of Public Education. These have been supplemented by releases concerning social and other Botanic Garden matters by the Brooklyn Publicity Bureau. In addition, an unusual number of news items have appeared without initiative on the part of the Garden. The total number of clippings received was 1,495, covering a wide geographic range. The number of editorial comments on various aspects of our work continues to increase.

School Service

As usual, our service to local schools during 1933 has comprised the instruction of school classes brought to the Garden by their teachers, the giving of talks and addresses at the schools, conferences with teachers concerning their work, and the supply of study material. Up to the close of the school year in June, 1933, study material had been supplied without charge. The amount requested steadily increased until, in 1932, more than 6,000 teacher-requests were met with material for the instruction of nearly 260,000 pupils. Most of this was living plant material, which had to be either collected or raised in the greenhouse, and culture medium (agar) for the study of germ life.

Our Agreement with the City of New York provides that, "the party of the second part [the Botanic Garden] shall, so far as any surplus resources will permit, furnish plants or botanic material for use in the teaching of botany in the public schools of The City of New York, and in case the supply of plants or materials for instruction is not exhausted by the demands of the public schools of the City, such plants and botanic materials may, at the discretion of the party of the second part, be furnished to other educational institutions within said City."

For a number of years past the amount of material supplied has been greatly in excess of incidental surplus. In the report for 1932 we noted that for the personnel alone required for this service 40 per cent. of the expense was provided from the private funds of the Garden. All of the expense for the material itself



FIG. 4. International Flower Show. Exhibit of Brooklyn Botanic Garden, 1933. Illustrating methods of plant propagation. Detail. Cf. Fig. 3. (Herbert Photos, 1738)

has been provided from private funds from the beginning, as the City has never been asked to make any appropriation for the purchase of plants or plant material.

With greatly reduced private funds income, reduced Tax Budget appropriations, and greatly increased demands from the schools, we found ourselves in a position where the service could not be continued without funds for additional help. The only possible source for such funds appeared to be to make a nominal charge for the material supplied to High Schools. The plan was approved by the school authorities, who sent out a notice announcing it in September to the High Schools. These schools have a fund which may be applied to the purchase of study material.

A schedule of prices was prepared by our Department of Public Instruction, and a school service assistant (Miss Julia E. Best) was appointed, whose compensation was to depend entirely upon the amount received from the schools. Miss Best entered upon the duties of her position on September 7. The curator of public instruction reports (page 96) that the number of High School requests for plant material (421) were actually greater under the new plan, being 34 in excess of 1931 and 23 greater than in 1932. The number of Petri dishes called for slightly decreased, being 4,888 in 1933. This was only 594 less than in 1931 and 839 less than in 1932.

The service to Public Schools (grades below the High Schools) has been continued without charge.

Geographical Extension of Loan Service.—The number of requests for the loan of books, herbarium specimens, lantern slides, and preserved specimens continues to increase. Partly as a result of our broadcasting, we received numerous requests from other cities and states, including Connecticut, New Jersey, Florida (through Brooklyn Chamber of Commerce), Pennsylvania, District of Columbia, and South Dakota.

A quantitative expression of our school service is given in Table I, page 38. Attendance figures could have been greatly increased by substituting lectures to large groups for intensive class work with small groups. We believe, however, that such a change would have involved the sacrifice of valuable educational results.

TABLE I
STATISTICS OF SCHOOL SERVICE

	1933	1932
<i>Conferences with Teachers</i>		
No. of conferences	127	83
No. of teachers involved	9,094	2,137
No. of pupils involved	209,000	95,695
<i>Loan Lectures (Lantern Slides, etc.)</i>		
No. of sets lent	38	22
No. of teachers involved	379	159
No. of pupils attending	19,034	6,320
<i>Material Supplied</i>		
Total number of requests from schools	609	643
Number of different institutions	196	220
High Schools and H. S. Annexes		
Brooklyn (Total No. 37)	28	29
Queens (Total No. 16)	9	9
Manhattan (Total No. 27)	13	14
Other Boroughs (Total No. 17)	9	5
Junior High Schools (Total in Brooklyn 22) ...	19	25
Colleges and Universities (Total in Brooklyn 7)	11	11
Elementary		
Brooklyn (Total No. 230)	60	82
Queens (Total No. 149)	3	6
Manhattan (Total No. 125)	3	4
Other Boroughs (Total No. 143)	2	3
Private and Parochial	19	32
Other Institutions	20	32
Number of potted plants for nature study	2,793	1,929
Number of Petri dishes filled with sterilized agar ..	4,858	5,730
Total number of teachers supplied with material ...	5,150	6,105
Total number of pupils reached	243,607	257,527
<i>Living Plants Placed in School Rooms</i>		
No. of schools	74	69
No. of plants	608	740
No. of teachers involved	756	891
No. of pupils reached	31,744	35,984
<i>Plants Distributed (Raised in Classes)</i>		
No. of teachers taking plants	21,764	27,520
No. of children taking plants	269	290
No. of children taking plants	933	983
Total number of schools represented	129	154
<i>Seed Packets for Children</i>		
No. of schools	381	549
No. of teachers	5,365	5,560
No. of pupils	214,395	223,397
No. of packets	643,178	670,202
<i>Exhibits Provided</i>		
No. of exhibits	21	17
Viewed by	550,085	40,845

PLANTATIONS AND GROUNDS

The purpose of our labeled plantations, and the educational program based upon them, is to bring "through the public eye into the public heart" ¹ an interest in our native flora and its conservation, and an interest in the plant life of the world and the creations of horticulture as an added satisfaction and enrichment of human life. The first step toward accomplishing this is to make the Garden beautiful; the second step is to make it instructive in more than a casual or incidental way. We have innumerable evidences and assurances that this object is being accomplished more and more fully each year.

Local Flora Section

The Local Flora Section (Native Wild Flower Garden) was opened to members and their guests (for the first time since its rearrangement) on May 9, the occasion of the annual Spring Inspection. This Section was originally laid out (in 1911) on a Systematic basis, like the main Section of the Garden. Under the curatorial supervision of Dr. Svenson the Section has been rearranged on an Ecological basis, which was rather fully described in the preceding Annual Report (pages 96-99). The fence enclosing this Section and the two rustic gates, all the gift of our late lamented trustee, Mr. Alfred W. Jenkins, make it possible to control access to it, as is now done for the Japanese Garden and the Rose Garden. The intimate nature of the planting makes it necessary to restrict the entrance of the general public to times when guards or gardeners are in attendance. This garden, like the other two mentioned, is comparable to a special exhibit room of a museum. It contains many rare species of the local flora, as well as the commoner sorts, and its use, in even the slightest degree, for ordinary park purposes, even for aimlessly strolling through, would defeat its purpose. Classes are freely admitted when accompanied by a Botanic Garden guide, members with accompanying friends are admitted by appointment, at mutually convenient times, and the general public will be admitted whenever an adequate number of guards can be in attendance.

¹ Dr. John M. Clarke. Ann. Rept. N. Y. State Museum for 1913.

Laboratory Plaza

Nothing has contributed more to the attractiveness of the Garden as a whole than the completion of the Laboratory Plaza. The central motif is a circular compass 18 feet in diameter. The rays of the compass are paved with yellow, red, and black marble terrazzo. The yellow marble is from Siena, Italy; the red from Massa, Italy; and the black from Mazy, Belgium. At the center of the compass is a bronze armillary sphere, serving as a sun-dial, and designed by our landscape architect, Mr. Harold A. Caparn. The figures representing the signs of the zodiac were designed and modeled by his daughter, Miss Rhys Caparn. The sphere is mounted on a beautiful pedestal of Carver black granite, from Vinal Haven, Maine, encircled near the top with a bronze band bearing the following old classical sun-dial motto:

Serene I stand amyddst ye flowres
To tell ye passing of ye howres.

The pedestal rests on an octagonal platform of Stony Creek (Connecticut) pink granite.

No single object in the Garden has attracted more constant attention than this Armillary Sphere. There is a group of people around it almost continuously, and teachers frequently bring classes there for a lesson based upon the dial.

At either end of the north and south grass panels are garden urns of classic design, 3 feet, 6 inches high.

Planting of the Plaza.—The Magnolia area has been extended so as to include the Plaza, the planting being confined to Magnolia species and to shrubs belonging to the same family. The only exceptions are the edging of English Ivy and *Euonymus alatus* var. *compacta*, which are a part of the design only, but not a part of the labeled collection. The planting of this Plaza was provided for by the generous gift of \$1,502 raised by subscription by our Woman's Auxiliary.

The new planting of Tulips along the west side of the Experimental Garden is recorded in the report of the Horticulturist (p. 89). This should make an interesting exhibit in 1934.

The transfer of the Paeonies to new beds near the north end of Cherry Walk is also recorded on page 89.

The first autumn frost, on the night of October 25-26, brought much of our fall bloom to an end earlier in the season than usual. Ice remained in the pool of the Conservatory Fountain until the afternoon of the 26th.

The Overlook, at the north end of the Rose Garden, was included in the five-year plan of permanent improvements published in the Botanic Garden RECORD for May, 1930. It was designed by Mr. Caparn, and was completed on May 7 by the firm of John Thatcher & Son, contractors. Like the conservatory fountain and the Armillary Sphere, it was made possible by the bequest of our late trustee, Mr. Alfred W. Jenkins. This has already become one of the most popular spots in the Garden.

Davidia in Bloom.—In 1919 a specimen of the Dove Tree, *Davidia wilsoniana*, was planted among the Dogwoods, to which it is related. This tree was introduced into Europe in 1897 from China, where it was discovered in 1869 by a French missionary, Abbé Armand David, after whom it is named. As the hardness of the plant in the Brooklyn climate is doubtful, it has been protected each winter. During the week of May 15, the tree came into bloom for the first time. As in the Flowering Dogwood, the so-called "petals" are bracts which enclose a cluster of small, inconspicuous flowers. When the flower-bud opens, the bracts are relatively small and greenish, later becoming larger and white. Unlike the Flowering Dogwood, which has the four petal-like bracts of the same size, one of the bracts of the *Davidia* is much longer and larger than the others. The tree, at present, is about 20 feet high. It bore only about 12 flowers.

The Dutch Elm-Disease, caused by a fungus *Graphium Ulmi*, while reported in New Jersey, has not, as yet, been detected in the Brooklyn Botanic Garden. The New York Times for August 11, 1933, reported that Dr. O. M. Liming, of the U. S. Department of Agriculture, found one diseased elm on Ocean Parkway near Prospect Avenue, Brooklyn. The disease first appeared in Ohio three years ago, and the second outbreak, reported in New Jersey, is said to have assumed large proportions, more than 200 infected trees having been located. The symptoms of the disease are a yellowing, browning, and wilting of the leaves, and the browning of the sapwood when young twigs are cut. The Federal

Public Works Administration (PWA) allocated \$80,000 to the Department of Agriculture for control work.

Needs.—The initial planting of the grounds included an Ecological Section (near the Rock Garden), and an Economic Garden. For lack of curatorial oversight and gardening labor, these two sections have been abandoned for some time. It is important that they should be rehabilitated. The newly graded area north of the Japanese Garden affords a suitable area for a new location for the Economic Garden.

Several permanent supports are needed for vigorously growing vines. Mr. Caparn has prepared a design and specifications for a trellis and pergolas for the Silver Leaf (*Actinidia*).

North Addition.—The greatest need is the landscaping of the North Addition. (See page 20.)

INTERNATIONAL SEED EXCHANGE

The systematic interchange of seeds between the United States and other nations (through both official and private channels) dates from the very beginning of this nation. After Thomas Jefferson returned to America from France, where he had represented the new United States of America, he began sending his French friends seeds of native American plants, receiving from them the seeds of French plants in return. This interchange continued for some twenty-three years.

"By his desire, our Consuls in every foreign port, collected and transmitted to him seeds of the finest vegetables and fruits that were grown in the countries where they resided. These he would distribute among the market-gardeners in the City [Washington] . . . not sending them but giving himself and accompanying his gifts with the information necessary for their proper culture and management, and afterwards occasionally calling to watch the progress of their growth. This excited the emulation of our horticulturists, and was the means of greatly improving our markets."¹

In 1933 we exchanged seeds with 207 other gardens located in 50 countries, receiving a total of 2,525 packets of seeds of their native plants and sending in return 4,367 packets of seeds of native American wild flowers and other plants.

¹ Smith, Mrs. Samuel Harrison. The first forty years of Washington society. Scribners. New York, 1906. p. 394.

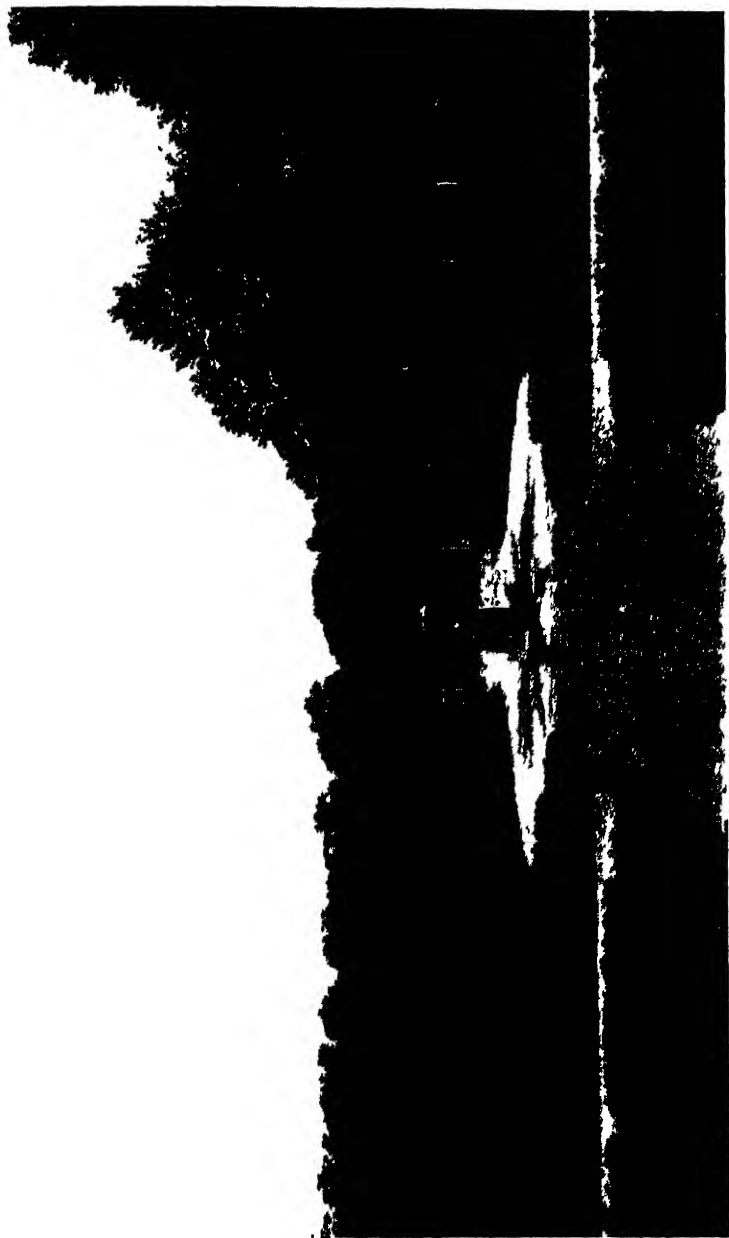


FIG. 5. Laboratory Plaza, facing west from the building. September 16, 1933. (8543.)

So far as our supply lasted, after other gardens had been supplied, packets were sent to members of the Garden—825 in all. About 95 packets were requested in excess of our ability to supply them.

THE LIBRARY

"I have often thought that science would progress more if there were more reading." Thus wrote Charles Darwin to Sir Joseph Hooker, the director of Kew Gardens, in 1865. No doubt Darwin was right. There is probably a more systematic attempt to "keep up with the literature" now than in Darwin's time, but the great bulk of botanical publication today is the despair of botanists. To read all the current literature, even of one's limited field of special interest or research, would be physically impossible. The situation is reflected by the number of serial publications of which current numbers have been received in our library during 1933, namely 979. These publications are in 26 different languages. Most botanists of university training are more or less at home in four languages; many in five or more. But material in languages outside the Romance and Teutonic groups, such as Russian, Japanese, Finnish, Magyar, and several others, is unavailable to most readers except those to whom such languages are the native tongue.

In view of this bulk and diversity, it is increasingly essential to have the current literature easily accessible, together with journals devoted to abstracts and summaries. A library rich in current publications as well as in standard and classical works, is an indispensable tool of research, and equally important in centers of educational work.

For obvious reasons, it is important to have periodical publications promptly bound, especially when usage is considerable or more or less constant. Special attention is called to the statement in the appended report on the Library, that almost no binding has been done during 1933, and that there is now an accumulation of more than \$3,000 worth of binding to be done. This becomes increasingly urgent since the number of users of the library steadily increases.

Technical publications are expensive, for the market is comparatively limited and the cost of publication relatively high since it in-

volves a great deal of "foreign language" composition and tabular matter for the printer, numerous illustrations, and a good grade of relatively permanent paper. The list of desiderata now on hand, noted in the Library report, amounts to more than \$6,000 worth of publications. A large proportion of these have been asked for by readers; others are classical and standard works that should be in every first-class botanical library.

In a previous report we have noted the fact that this Library did not have a generous initial fund for the purchase of a nucleus. It started in January, 1911, with a gift of nine books, and has been gradually built up to its present size of 30,938 volumes and pamphlets by annual expenditures of small sums, supplemented by items secured by gift, publication, and exchange. The Library has a small endowment nucleus. Its use and usefulness increase each year. Its further endowment affords an admirable opportunity for the advancement of science and education by private philanthropy.

THE HERBARIUM

The statement in the first paragraph of the appended report of the associate curator of plants emphasizes the importance of the herbarium and its relation to published records of plants in books and periodicals. During 1933 the herbarium of flowering plants (Phanerogams) increased by 4,000 specimens, lacking eleven, and that of the non-flowering plants (Cryptogams) by 1,125 specimens. 473 specimens were loaned for study to other institutions.

Even at its present moderate rate of growth it will not be long before the Herbarium will have quite outgrown its present quarters.

MEMBERSHIP

The support of museums, botanic gardens, and zoological parks is a civic duty. These institutions minister to the entire population, whereas the schools minister directly only to those under twenty-five years of age. During 1933 113 new members were enrolled, as against 222 in 1932. The net decrease has been 57. The figures are 1,205 in 1933 as against 1,262 in 1932. The figures, though small, are very satisfactory when we recall the eco-

nomie condition of the world, and realize that more institutions and organizations are reporting large net losses than net gains. Our record is the result of the continued effective efforts of the Woman's Auxiliary. Mrs. Henry J. Davenport has continued as Chairman of the Membership Committee of the Auxiliary, and the activities chiefly responsible for new members have been in charge of Mrs. Whitney Merrill, member of the Auxiliary and Field Secretary.

The distribution of surplus propagating material to members continued for the ninth year. This is one of the numerous privileges extended to members in consideration of the payment of their membership fee. It has the effect of increasing interest, not only in the Botanic Garden, but also in plant life and gardening, and thus should be of advantage to commercial horticulture. In fact, we have evidence that such is the case. During the year several hundred members were supplied with propagating material in the total of 4,170 plants.

WOMAN'S AUXILIARY

The Woman's Auxiliary has become an integral and indispensable part of the regular work of the Garden. At the close of the year it had 113 members. Under its auspices numerous garden clubs and other organizations held meetings at the Garden, and the course in Flower Arrangement was initiated. This was one of the most popular and better attended of our winter courses. Six sessions were held from January 3 to February 7, and 117 persons were registered for the course. The first three lectures were given by Miss Mary Averill, honorary curator of Japanese gardening and floral art at the Garden. Miss Averill's book on Japanese Flower Arrangement, published in 1913, was the first book on flower arrangement of any kind to be published in America. The other lectures were given by Miss Maude Mason (one); and by Mrs. William H. Cary, author of the second American book to be published on flower arrangement—*Arranging Flowers Throughout the Year* (two lectures). It is of interest to note that the authors of these pioneer books are both officially connected with the Brooklyn Botanic Garden.

The Woman's Auxiliary luncheon was held in the rotunda of

the Laboratory Building on February 7, following the last session of the Flower Arrangement course. There were 107 in attendance. The address was given by Dr. Svenson, associate curator of plants, on the Local Flora Section of the Garden and his scientific and educational work in connection therewith.

On November 22, under the auspices of the Auxiliary, Dr. Norman T. McClintock, of Rutgers University, gave a lecture at the Garden on the subject *Romance in the Commonplace*. The lecture was illustrated by motion pictures of plants, insects, humming birds, and other subjects and proved to be a fascinating revelation about more or less commonplace events in the plant and animal worlds.

Among other subjects shown were the growth of lettuce, the development of a pea pod from a flower, the twining of tendrils, and the growth movements (including nutation) of various wild flowers. The auditorium, which seats 570, was filled to capacity. The net proceeds of \$735 were contributed by the Auxiliary to supplement the amount available for per diem labor at the Garden, thus reducing lay-offs and the unemployment that would result.

NINETEENTH ANNUAL SPRING INSPECTION

The Nineteenth Annual Spring Inspection was held, as usual, on the second Tuesday of May, which fell on the ninth. This has become one of the largest and most popular garden parties in the metropolitan district. The attendance in 1933 was one of the largest on record, being estimated at well in excess of 1,000.

The tour of the grounds included inspection of the following new features: Laboratory Plaza, planted in April, 1932; Boulder Hill Bronze Tablet, the funds for which (\$50) were presented by our Boys and Girls Club in 1932; the Japanese Garden, in which there were several improvements and new features, made possible by a gift of private funds and executed by Japanese workmen, under the supervision of Miss Mary Averill; Cherry Walk, which was at the height of bloom; the Overlook, at the north end of the Rose Garden, affording an excellent view of the entire garden from a height of 20 feet; the Local Flora Section, opened on Inspection day for the first time since it was replanted along ecological lines by Dr. Svenson; and the North Flatbush Avenue Approach, re-

cently done over, with boulder banks on each side of the walk, newly paved with green "amesite" and broken by three new flights of steps; also the rows of hornbeams planted on either side of the walk leading to the gate. These trees will be trained so as ultimately to form a pleached alley. So far as we know, there is no example of a pleached alley in a public park in or near New York.

The indoor exhibits included: Twenty-five photographs of flower arrangements done by Mrs. Cyrus Winslow Merrell from arrangements made by Mrs. William H. Cary. These included the originals of the sixty illustrations in Mrs. Cary's new book, *Arranging flowers throughout the year*; Illustrations of artificial flowers in various media extending over the past two centuries. This collection was made by Mrs. Richardson Wright, and was exhibited through her courtesy. Also Photographs of illustrations in the *Codex Juliae Aniciae*, of Dioscorides, 512 A.D., lent for this exhibit by Miss Pauline Goldmark, of the Hartsdale (N. Y.) Garden Club; 300 mounted herbarium specimens of cultivated plants prepared by Dr. Henry K. Svenson, including tulips, narcissus, crocus, and other plants, mounted so as to preserve their natural colors as well as structural features; Design, in perspective, of the North Addition of the Botanic Garden, by Mr. Harold A. Caparn. This is reproduced as figure 1 of this Report. Tea was served, as usual, by the Woman's Auxiliary.

PERSONNEL

On December 7 occurred the death of Mr. Frank L. Babbott, a Life member and Patron. He was president of the Board of Trustees from May, 1920, to May, 1928, and in that capacity was ex officio a member of the Botanic Garden Governing Committee. From 1928 until his death he was honorary president of the Board. Mr. Babbott was a frequent contributor of funds to the Botanic Garden.

Mr. Richard R. Bowker, a Life Member of the Institute, and a member of the Board of Trustees, died on November 12, 1933. In 1928 Mr. Bowker presented to the Garden the beautiful bronze Merchild, done by Miss Isabel M. Kimball. Since April, 1929, this has been an object of much interest in its naturalistic setting in the bed of the Brook, just south of the "swamp" in the Ecological Section.

Mr. Edwin Gould, a Patron and member of the Botanic Garden Governing Committee, 1926-1929, died suddenly on July 12, 1933, at his estate on Cove Road, near Oyster Bay, Long Island, at the age of 67 years. In 1926 Mr. Gould contributed \$25,000 to the Citizens Endowment Fund then being raised.

Mr. Calvin W. Foss, librarian, was absent throughout the year on sick leave. During his absence Mrs. Emilie Perpall Chichester has been Library Assistant in Charge.

On September 1, 1933, Miss Ellen Eddy Shaw, curator of Elementary Instruction, completed twenty years of service at the Garden, as follows: Instructor, September 1, 1913-December 31, 1914; Assistant Curator, Public Instruction, January 1-December 31, 1915; Curator of Elementary Instruction, January 1, 1916-.

At a meeting of the Botanic Garden Governing Committee, on June 22, the members present expressed warm appreciation of Miss Shaw's services to the Garden and, through the Garden, to the Borough of Brooklyn during these twenty years. A resolution was unanimously passed requesting the director so to notify Miss Shaw, and to convey to her an expression of the high regard and affection of the Committee.

On May 22, the Garden Teachers Association of the Botanic Garden gave a dinner in honor of Miss Shaw, on November 12 a tea for the Botanic Garden personnel and officials was given at the home of the Director, and on December 15 a reception and tea was given in Miss Shaw's honor at the home of the chairman of the Governing Committee, Miss Loines.

Beginning September 7, Miss Julia E. Best, A.B., Barnard College 1931, M.A., Columbia University 1933, accepted appointment as School Service Assistant in the Department of Public Instruction, to assist in the supply of study material to high schools and colleges. (Cf. p. 37.)

Miss Mary Dorward, a graduate of the Pratt Institute School of Library Science, 1933, very generously contributed her services without compensation as library assistant from October 2 until the end of the year.

Mr. Gerald Sherow gave his services gratis in the Propagating Department for a total of twenty-two days between the following dates: December 18, 1933-January 25, 1934.

From June 5 to the end of the year, Mr. Henry Funk, gardener, contributed his services without pay for the sake of the experience of being at the Botanic Garden.

FINANCIAL

Only a slight acquaintance with the facts enables one to appreciate on what a very modest scale the Brooklyn Botanic Garden has been launched and carried for twenty-three years. The Director of one of our public museums recently reported to a scientific congress that, during the past quarter century (the lifetime, lacking two years, of the Brooklyn Botanic Garden), \$38,000,000 had been raised and expended in developing the various branches of the museum. The same institution, now more than fifty years old, has only recently made public a statement emphasizing the fact that it is very inadequately financed. No doubt it is, considering the extent, importance, and results of its work, and the public response to the opportunities it offers. But such figures dwarf the modest total of a little over \$3,100,000 expended for the establishment of the Brooklyn Botanic Garden, including the initial cost of buildings, and all other permanent improvements and the annual maintenance budgets for the past twenty-three years.

This comparison is made because, to those even slightly familiar with the rapid growth and wide expansion of the activities of the Botanic Garden, the contrast serves to emphasize the conservatism and extreme economy that have characterized the financing of this institution.

The work is not now financed on a scale commensurate with its importance and its human appeal. The Brooklyn Botanic Garden could double its services to science and education if its annual private funds income were increased only fifty per cent. The present annual budget of approximately \$200,000 is derived nearly equally from the Tax Budget Appropriation of the City of New York, and from private funds income. One million dollars of additional endowment, yielding approximately \$55,000 additional income, would meet the existing needs, providing, of course, that the Tax Budget appropriation does not fall below its 1932 figure.

Passing over the importance of our work in intangible ways that cannot be registered by recording turnstiles, it must be recog-

nized that attendance figures which reach more than 38,300 for one week-end, nearly a quarter of a million for one month, and more than one million and a quarter for a calendar year are alone evidence of sufficient public interest and benefit to justify more nearly adequate financing.

Public Interest in Science and Art

The Office of Education, U. S. Department of the Interior, has published a report on the "Recent progress and condition of museums."¹ When we consider the extent to which modern civilization is dependent upon scientific research and inventions based upon its results, it is interesting to note that the combined public and private support of public education through the medium of science museums, in the United States in 1930, was less than two-thirds that of art education through art museums.

According to Table 10 of the above mentioned report, the aggregates of total incomes of public museums in 1930 was, for art museums, \$7,394,000; for science museums, \$4,796,000. The income from endowment of art museums in 1930 was \$4,118,000; of science museums, \$3,258,000, or about three-fourths that of art museums. Income from gifts and dues was, for art, \$511,000; for science, \$390,000, or less than four-fifths that for art. And yet this is often called "the age of science." In fact, the large fortunes out of which art has been so generously endowed were made possible, in large part, by scientific research and invention. Few fortunes have been made by art. Art is endowed by science. Science is endowed by art, but not financially.

Do these figures mean that, notwithstanding our debt to modern science, more people are interested in art than in science? Or that more people can understand art than can understand science? Or, possibly, that those whose interests are in art are possessed of more of this world's goods, or are perhaps more generous or more public spirited? It may well be that a part of the answer is contained in each of these four suggestions. In any event, the fact remains that art museums are more generously supported in the United States than are science museums.

¹ Bulletin, 1931, No. 20. By Laurence Vail Coleman, Director, the American Association of Museums. Washington, 1932.

Botanic gardens (and zoological parks) are not included in this report, but museums operated in or by such parks or gardens are included. We would not for a moment wish to minimize the importance of generous support of art; it more than merits all it is ever likely to get. But the above contrast is full of meaning and ought to be full of suggestion for all who are interested in the advancement and diffusion of science, and the development of the Brooklyn Botanic Garden.

Tax Budget and Private Funds

The Tax Budget appropriation for maintenance in 1933 was as follows:

	<i>Requested</i>	<i>Granted</i>	<i>Change from 1932</i>
Personal Service	\$ 84,660.00	\$69,266.00	\$13,394.00 (Decrease)
Other Codes	16,465.00	13,713.44	2,751.56 (Decrease)
	\$101,125.00	\$82,979.44	\$16,145.56 (Decrease)

The Private Funds Budget was \$92,943.52, as against \$99,-580.35 in 1932, a decrease of only \$6,636.83, as against the Tax Budget decrease of \$16,145.56.

The Private Funds Budget was \$9,964.09 more than the Tax Budget.

For the past six years the percentages of the two budgets have been as follows:

	<i>1928</i>	<i>1929</i>	<i>1930</i>	<i>1931</i>	<i>1932</i>	<i>1933</i>
Tax Budget	48%	43%	44%	48%	50%	47.2%
Private Funds	52%	57%	56%	52%	50%	52.8%

Collections Funds Contributions

Although the *Agreement* between the City of New York and the Botanic Garden provides that the City shall include in its annual Tax Budget appropriations for the support of the Garden a sum or sums for the purchase of books and publications, the City has never been asked to make any appropriation for that purpose. The City is not obligated to make appropriations for the purchase of plants, but is obligated to appropriate for the care of all collections. We are, therefore, dependent upon private funds

for the purchase of plants (including herbarium specimens) and all publications. The Collections Fund is normally for this purpose. Fortunately, some of the endowment fund income is also available for the same purpose. We say "fortunately," for the contributions to the Collections Fund vary. The amount for 1927, for example, was 38 per cent. greater than for 1933. There has been a steady decrease during the past seven years, as follows:

1927	1928	1929	1930	1931	1932	1933
\$9,882	\$7,420	\$7,282	\$6,539	\$6,762	\$6,157	\$6,134

The amount available annually has always been less than was needed. It is hoped that eventually there will be endowment income sufficient to place this aspect of our work on a permanent assured basis, and make it unnecessary to depend so largely upon contributions solicited each year. During 1933 a large part of the Collections Fund (with the consent of the contributors) was used for labor to help decrease unemployment.

Legacies

E. Addie Austin Bequest.—For a number of years a frequent attendant at the Garden and its functions was Miss E. Addie Austin. Miss Austin's death occurred on January 21, 1933. Her will contained the following provision:

"I give and bequeath to the Brooklyn Botanic Garden and Arboretum the sum of One Thousand Dollars (\$1,000) to be used for its corporate purpose."

This legacy was received on August 3, 1933, and has been credited to the endowment increment principal account.

Alfred W. Jenkins Bequest.—The death of Mr. Alfred W. Jenkins, a Life Member and Patron of the Garden, a Trustee, and a member of the Botanic Garden Governing Committee, in Vichy, France, on September 28, 1932, was recorded in our preceding Annual Report. In his will, Mr. Jenkins bequeathed \$5,000 to the Botanic Garden. On account of numerous urgent needs and in consideration of the fact that Mr. Jenkins's chief interest was in beautifying the grounds, it was decided to expend this amount for that purpose. Among the objects financed with this bequest are the following:

1. The Armillary Sphere in the center of the paved compass in the Laboratory Plaza.
2. The pedestal of Carver black granite supporting the Sphere, and the bronze band around the pedestal.
3. The bronze tablet to mark the sphere.
4. The terrazzo paving of the compass.
5. Four vases in the Laboratory Plaza.
6. Construction of the Overlook, with seats, at the north end of the Rose Garden.
7. Bronze tablet to mark the Overlook gift.

APPENDED REPORTS

The Reports on Research for 1933, the administrative departmental reports, and Appendices 1-8, which follow this report, contain more detailed information concerning the year's activities and accomplishments.

Respectfully submitted,

C. STUART GAGER,
Director.

REPORTS ON RESEARCH FOR 1933

PLANT PATHOLOGY

BY GEORGE M. REED

Studies on the Inheritance of Resistance of Oat Hybrids to Loose and Covered Smut

Experiments with the Second Generation of Oat Hybrids. The second generation plants of four oat hybrids, Canadian \times Monarch, Canadian \times Monarch Selection, Gothland \times Black Mesdag, and Danish Island \times Monarch, were available for the study of the inheritance of resistance to loose and covered smut. Two series of plants of each hybrid were inoculated, one with the loose smut and the other with the covered, and the percentage of susceptible plants determined.

Hybrid 79, Canadian \times Monarch, was represented by three crosses, and is a hybrid between the variety Canadian, susceptible

to both loose and covered smut, and Monarch, resistant to the loose smut, but susceptible to the covered. There were 287 second generation plants inoculated with the loose smut, and 113 (39.3 per cent.) were infected. These results clearly indicate that segregation for resistance to the loose smut occurs in the second generation. In the corresponding series with the covered smut, 90 plants were inoculated, and 89 (98.8 per cent.) were infected; thus the second generation plants were as susceptible to covered smut as the two parental varieties.

Hybrid 80, Canadian \times Monarch Selection, affords an interesting contrast to Hybrid 79. Both parental varieties are susceptible to the loose smut, while Monarch Selection is resistant to the covered smut. There were 97 second generation plants inoculated with the covered smut and 28 (28.8 per cent.) were infected. Segregation for resistance to the covered smut is indicated. There were 49 second generation plants inoculated with the loose smut, and 48 (97.9 per cent.) were infected; thus the second generation plants were as susceptible to the loose smut as the two parental varieties.

Hybrid 81, Gothland \times Black Mesdag, is a cross between two varieties which are resistant to covered smut, while Gothland is susceptible to the loose smut. There were 97 plants inoculated with the loose smut and 26 (26.8 per cent.) were infected, a result usually obtained in the second generation when a susceptible variety is crossed with a resistant. In the series with the covered smut, there were 47 plants inoculated, and none were infected, thus corresponding in their behavior to the two parental varieties.

Hybrid 82, Danish Island \times Monarch, was represented by five crosses. Danish Island is very susceptible to the loose smut and resistant to the covered smut, although occasionally a few plants are infected. Monarch, on the other hand, is very resistant to the loose smut and susceptible to the covered. There were 293 second generation plants inoculated with the loose smut and 57 (19.4 per cent.) were infected. In the series with the covered smut there were 287 plants inoculated, and 205 (71.4 per cent.) infected.

The results with Hybrids 79, 81, and 82, with the loose smut, suggest a characteristic segregation on the basis of a ratio of three resistant plants to one susceptible. The percentage of infection

in Hybrid 79 was much higher than might be expected. However, a large number of plants, namely 287, were inoculated, and it is interesting to note that the three different crosses of this hybrid gave very similar results.

The results with Hybrid 80, inoculated with the covered smut, also indicate a segregation on the basis of a ratio of three resistant to one susceptible plant. Hybrid 82, represented by five different crosses, has given a very different result with the covered smut. The segregation in the second generation has indicated three susceptible plants to one resistant, just the opposite from the results previously described. There were a large number of plants of the five crosses inoculated, and the range of infection in the different crosses was quite similar. It may be noted that the one parent, Monarch, is completely susceptible to the covered smut, and that the other parent, Danish Island, sometimes contains infected plants.

In Hybrid 79, both parents were very susceptible to the covered smut, and practically all of the second generation plants were infected. Thus, these plants were as susceptible to this smut as the parental varieties. Similar results were observed in Hybrid 80 with reference to the loose smut. In this case also, both parental varieties were extremely susceptible to the loose smut. In Hybrid 81, the two parents were resistant to the covered smut, and complete resistance was observed among the second generation plants.

Experiments with the Third Generation of Oat Hybrids. The third generation progenies of two different oat hybrids were grown. Of Hybrid 61, Orientalis \times Victor, there were 47 third generation progenies inoculated, one set of seed with the loose smut, and another with the covered. Both parental varieties are very susceptible to the loose smut, and the progenies grown gave percentages of infection varying from 68.1 to 100, in 13 of them all the plants being smutted. The variety Victor is very susceptible to covered smut, while Orientalis is resistant. Of the 47 progenies, 8 were entirely resistant, 24 gave infections of 8.3 to 47.8 per cent., and the remaining 15, more than 51 per cent. infection; in 4 of the progenies all the plants were smutted.

There were grown 33 third generation progenies of Hybrid

64, Rossman \times Monarch. Rossman is susceptible to loose smut and resistant to the covered, while Monarch is exactly the reverse in its behavior. The progenies showed independent behavior with reference to these two smuts. In the series inoculated with the loose smut, 5 were resistant, 23 gave less than 50 per cent. infection, and 5 gave more than 70 per cent. In the series with the covered smut, 13 progenies were resistant, 12 gave less than 50 per cent. infection, and 8 more than 50 per cent.

Experiments with the Fourth Generation of Hybrids. In former reports, the data on many additional oat hybrids have been recorded and, during the past year, fourth generation progenies of some of these were grown.

Hybrid 18, Silvermine \times Black Mesdag, was represented by 69 progenies, and Hybrids 34 to 36, Early Champion \times Black Mesdag, by 42 progenies. Practically all of these in all the hybrids had descended from resistant third generation families. Silvermine and Early Champion are both very susceptible to loose and covered smut, while Black Mesdag is resistant to both and, throughout the second, third, and fourth generations, the hybrids have shown a very similar behavior to loose and covered smut. During the past few years very extensive data have been accumulated on these two sets of hybrids, and have been prepared for early publication.

There were 85 fourth generation progenies of Hybrids 29 to 32, Fulghum \times Black Mesdag, tested with the Fulghum Race of loose smut. Most of these had descended from resistant third generation progenies, and complete resistance to the special race of loose smut was established in the fourth generation.

A large number of fourth generation progenies of Hybrids 50 to 69, involving various combinations of crosses, were grown. The accumulated data are valuable in determining the mode of inheritance of smut resistance in these various types of hybrids. Separate sets of progenies, one inoculated with loose smut and the other with the covered, were planted.

Physiologic Races of Oat Smuts

Further experiments were carried out with some of the physiologic races of both loose and covered smut. The most extensive

data were obtained with collections of these smuts on the Fulghum type of oats. Through the cooperation of Mr. T. R. Stanton, Office of Cereal Crops and Diseases, Bureau of Plant Industry, Washington, D. C., we now have 10 collections of loose smut from different parts of the South, where Fulghum oats are extensively grown. These collections have been tested out on a number of different varieties, and their behavior determined. We have been able to demonstrate clearly that there are at least two distinct races of loose smut specialized to the Fulghum oats. These are distinguished on the basis of their ability to infect particular oat varieties.

Three collections of covered smut on Fulghum oats have been obtained from the South. One of the most interesting features of these collections is their ability to infect Black Mesdag, a variety resistant to all other known collections of both loose and covered smut.

Bunt of Wheat

Additional experiments were carried out with several physiologic races of bunt of wheat. These were tested on wheat varieties which have shown differences in their reaction to specialized races of the two species of bunt. The particular purpose of the experiments was to determine whether certain wheat varieties were identical in their behavior to the various races, or whether these varieties could be separated from each other on the basis of their infection by distinct races of bunt.

Sorghum Smuts

Miss D. Elizabeth Marcy has continued her studies on the inheritance of resistance of various sorghum hybrids to the covered kernel smut of sorghum. The second generation plants of 18 sorghum crosses were grown, each cross being represented by 50 to 100 plants. On the basis of the behavior of the parental varieties, the crosses may be divided into three groups:

1. Both parents resistant. There were two reciprocal crosses between Feterita and Dwarf Yellow Milo, varieties which have consistently been resistant to the covered kernel smut. All of the inoculated second generation plants remained entirely free from infection.

2. One parent susceptible, and the other parent resistant to the covered smut. There were 14 crosses between a susceptible and resistant variety. In 7 crosses, the resistant Feterita was combined with the susceptible Sumac Sorgo, Red Amber Sorgo, and Dawn Kafir. In all these cases, second generation plants gave 47.7 to 72.1 per cent. infection. In contrast to these hybrids are those in which the resistant Milos are crossed with susceptible varieties. There were also 7 crosses of this type, Black Amber Sorgo, Blackhull Kafir, and Dawn Kafir, being combined with Dwarf Yellow Milo, Standard Yellow Milo, and Standard White Milo. In these hybrids, the second generation plants gave 8.1 to 17.1 per cent infection. It is evident from the results that the resistance of Feterita to covered smut is different from that of the Milo varieties.

3. Both parents susceptible to the covered smut. There were two hybrids between susceptible varieties, Blackhull Kafir and Dawn Kafir, being crossed with Red Amber Sorgo. The second generation plants contained 61.9 to 67.5 per cent. of smutted plants.

A series of third generation progenies belonging to four different hybrids was inoculated with the covered smut. In every case, these progenies were descended from the surviving second generation plants which had been inoculated with this smut in the previous year. There were 10 third generation progenies of Dawn Kafir \times Red Amber Sorgo, both very susceptible varieties. The second generation plants in the previous year gave 50.9 per cent. infection. All of the 10 third generation progenies contained infected plants, the percentage varying from 20 to 95.

There were 30 third generation progenies of the hybrid of Black Amber Sorgo \times Dwarf Yellow Milo, the former being very susceptible, while the latter is resistant. Three of these progenies proved to be completely resistant, 23 gave from 5.2 to 26.6 per cent. infection, and 4 gave 42.1 to 60.0 per cent.

There were 30 third generation progenies of the hybrid Feterita \times Dwarf Yellow Milo. Both of these varieties are very resistant and, as noted above, the second generation of this cross gave entirely negative results. It was found, however, that 5 of the third generation progenies contained infected individuals, the percentage

varying from 5.5 to 31.2. The remaining 25 progenies contained no smutted plants.

There were 30 third generation progenies of the hybrid Dwarf Yellow Milo \times Feterita. This hybrid is the reciprocal of the one just referred to. Only one of these progenies contained an infected plant, and in this progeny one plant out of 14 was smutted.

There were 170 fourth generation progenies of two hybrids of Feterita \times Sumac Sorgo grown. These were descended from the surviving plants of third generation progenies which gave different percentages of smut, and the results obtained have thrown a great deal of light on the inheritance of smut resistance in these particular hybrids.

One of the important problems in connection with these studies is that of securing the infection of all susceptible individual plants. Further experiments were made on the influence of environal factors on the infection of some susceptible and resistant varieties. It was found that a much higher percentage of smutted plants of such susceptible varieties as Blackhull Kafir, Dawn Kafir, Dakota Amber Sorgo, Sumac Sorgo, and Red Amber Sorgo, was secured when the inoculated seed were germinated in sand with a low percentage of water. Excellent results were also obtained when a somewhat higher percentage of moisture was used, to which a weak sugar solution was added. In all cases, resistant varieties such as Feterita and Milo remained free from smut. In general, all the susceptible varieties and the hybrids gave higher percentages in 1933 than in 1932, probably due to securing an environment more favorable to infection during the seedling stage.

A large amount of data on the inheritance of various morphological features in relation to smut resistance has been obtained. The most extensive studies have been made on the inheritance of pithy and juicy stem, and on the red and green color of seedlings.

Cultural Characteristics of the Oat Smuts

Mr. L. Gordon Utter has continued his studies on the characteristics of both loose and covered smut of oats as grown in cultures in flasks. Under natural conditions, the smuts are parasites which invade the host plant in the young seedling stage and



FIG. 6. Cultures of loose smut of oats in flasks. Each culture was developed from a single chlamydospore, and illustrates some of the characteristic differences which may be observed within the same physiologic race of loose smut. (8001.)

continue their development until the heading time of the oats, when the flowering parts are replaced by enormous numbers of black dust-like spores. These spores are known as chlamydospores and, under favorable conditions, germinate, producing a short hypha, or thread, on which are developed secondary spores, or conidia. It is by means of these conidia that the invasion of the young seedling oat plant takes place. Both chlamydospores and conidia, however, may be transferred to suitable substances in flasks, where they will give rise to characteristic growths, which may be studied and compared one with the other. The appearance of three cultures of the loose smut of oats is shown in figure 6.

These cultures in flasks are interesting for a comparison of the behavior of the two species of smut, and also for the highly specialized physiologic races. The cultures may be developed by the isolation of single chlamydospores, or by the isolation of the secondary conidia, and cultures derived by different methods have been used in the studies. Many isolations from single chlamydospores of both loose and covered smut have been obtained. Some of the cultures of loose smut are very similar in their appearance, while others show considerable variation. The same is true of the cultures of covered smut. Further, many of the cultures of the covered smut are essentially identical with those of the loose smut, and it does not seem possible to clearly differentiate the two species by constant characteristics of the cultures.

Comparisons have been made between the cultures of different races, derived from single chlamydospores. Many of the cultures of the same race are essentially identical in appearance, while others show marked differences. Further, cultures from different races can be selected which are remarkable for their uniformity and, by a proper selection of cultures, very diverse types of growth may be obtained.

Many isolations from single conidia have also been made, and similar differences in the behavior of the cultures to those isolated from chlamydospores have been observed.

Some inoculation experiments have been carried out. Cultures of loose smut derived from single chlamydospores have been used to inoculate Gothland and Monarch oats, the former being very

susceptible to the particular race of loose smut used, while Monarch is resistant. In most of the experiments, Gothland was successfully infected, while Monarch remained free. Similar experiments were carried out, using cultures of covered smut and, in these experiments, Monarch was infected while Gothland was not. Attempts have been made to infect both Gothland and Monarch with single conidial cultures of definite races of the two smuts. Other experiments have been made in which a culture derived from two conidia in certain combinations has been used.

GRADUATE STUDENTS AND INDEPENDENT INVESTIGATORS ENROLLED DURING 1933

In addition to the members of the Botanic Garden personnel, four graduate students and independent investigators were engaged in carrying on botanical research in the laboratories of the Garden.

Mrs. Marie E. Conklin has continued her investigations on the bacteria which form the tubercles on the wild legumes. Her studies involve the problem of the cultural characteristics of the bacteria isolated from different plants, and also their capacity for infecting. She began her studies at the University of Wisconsin, where she obtained the A.M. Degree in 1930. She is continuing her investigations, with a view to submitting the data as a basis for a Doctor's thesis at Columbia University.

Dr. Frances A. Hallock, Associate Professor of Biology in Hunter College, has used some of our facilities in connection with her study of the morphology and relationship of the evergreen shrub *Gaarya*.

Dr. Elva Lawton, a member of the Biology Department of Hunter College, has continued her investigations on regeneration and polyploidy in ferns. Her studies are a continuation of researches carried out in the University of Michigan, where she received the Doctor's Degree in 1931.

Mr. Hans E. Vollert, during the first part of the year, was enrolled at New York University, majoring in plant pathology at the Botanic Garden. Mr. Vollert is a graduate of the University of Leipzig, and also has the equivalent of the degree of Master of Science from that Institution. He was engaged in the study of the cultural characteristics of certain smuts, and had also taken up some work on the thrips of the iris and gladiolus.

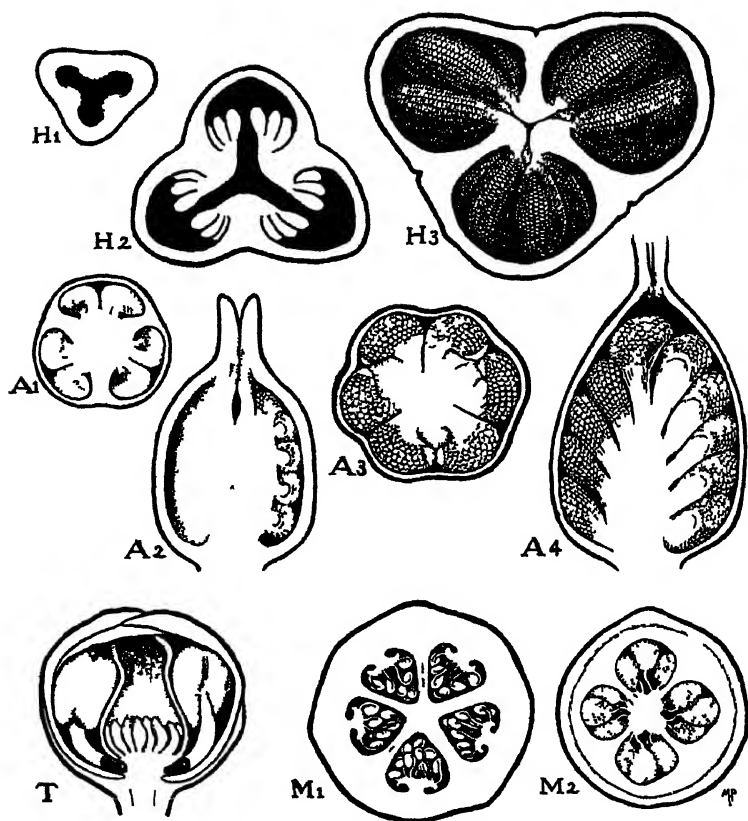


FIG. 7. Types of placentation (attachment of ovules). H, *Hyppocrepium densiflorum*; Axile placentation in this case has developed from initial parietal placentation; H 1-2, flower buds with ovules on walls of ovary; H 3, adult flower with ovules on axis, formed by the ingrowth of the placentae. A, *Arenaria Korinceana*; Central placentation here has developed from initial axile placentation; A 1-2, flower buds where ovary-walls connect with style; A 3-4, adult flower with central axis separate. T, *Tamarix pentandra*; Basal placentation with many ovules, occurring only in a few groups (probably a primitive form). M 1, *Mesembryanthemum spectabile*; M 2, *Mesembryanthemum cordifolium*, showing great difference in attachment of ovules in the same genus.

SYSTEMATIC BOTANY

BY ALFRED GUNDERSEN

The Genus Staphylea

With Mr. C. F. Doney, I have been making a study of about three hundred specimens of the genus *Staphylea* from the herbaria of the Brooklyn Botanic Garden, the New York Botanical Garden, the Arnold Arboretum, the U. S. National Herbarium, and the Missouri Botanical Garden. This genus is widely distributed in Europe, Asia, and North America. Of twenty-eight names which have been assigned to *Staphylea* four belong to other families and five to the related genus *Turpinia*, others are synonyms or included in the accepted species, leaving only eight or possibly nine distinct species.

The Classification of Dicotyledons

The study of floral structures of many species of dicotyledons has been continued, with drawings by Miss Maud H. Purdy. The drawings are dated, and we are gradually following up the study of missing parts of structures of flower buds at the proper season. Attention is being given especially to placentation and to changes in placentation as the flower develops, as illustrated in fig. 7. Eichler wrote in his *Blütendiagramme*, page 47, in 1874, "the whole question of placenta-formation merits very much a new investigation, at the same time from a developmental and systematic-comparative point of view." This holds true in 1934, sixty years after.

Hardy Species of Trees and Shrubs

With Mr. Alfred Rehder, of the Arnold Arboretum, I have continued the work on an alphabetical list of trees and shrubs based on his *Manual of Cultivated Trees and Shrubs*. The plan of the work has been somewhat revised and expanded. In this work we have been joined by Mr. Henry Teuscher, dendrologist of the New York Botanical Garden. After each species there is given the author, the year of publication, height, geographic distribution, and zone of hardiness. In case the species was first described under another genus that genus also is given. An example follows:

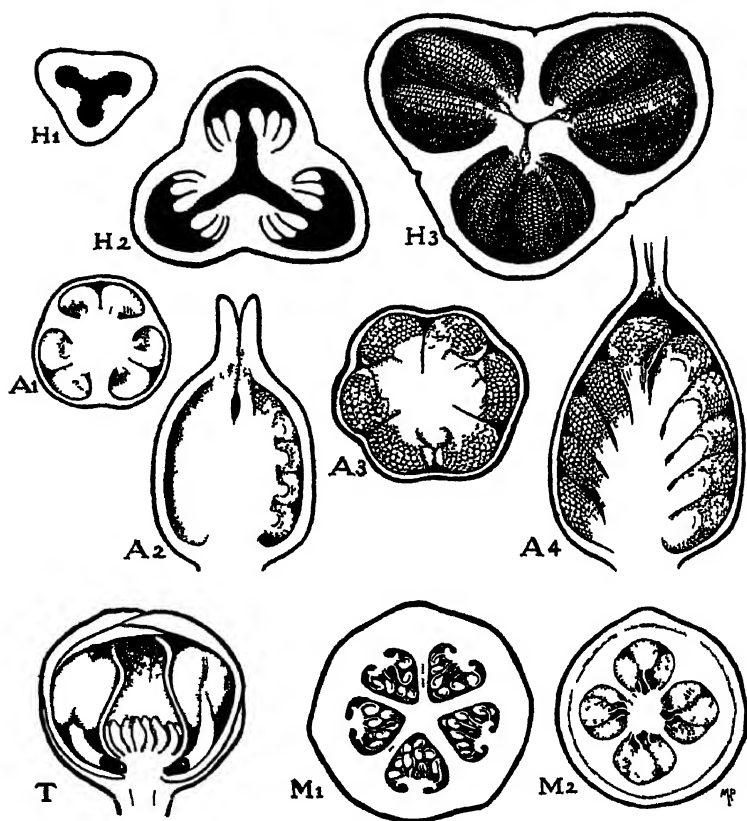


FIG. 7. Types of placentation (attachment of ovules). H, *Hyppericum densiflorum*, Axile placentation in this case has developed from initial parietal placentation; H 1-2, flower buds with ovules on walls of ovary; H 3, adult flower with ovules on axis, formed by the ingrowth of the placentae A, *Arenaria Koimcana*; Central placentation here has developed from initial axile placentation; A 1-2, flower buds where ovary-walls connect with style; A 3-4, adult flower with central axis separate. T, *Tamarix pentandra*, Basal placentation with many ovules, occurring only in a few groups (probably a primitive form). M 1, *Mesembryanthemum spectabile*; M 2, *Mesembryanthemum cordifolium*, showing great difference in attachment of ovules in the same genus.

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Symphoricarpos Juss. 1789 15 sh Caprifoliaceae 271-3
 albus (L. 1753 sub Vaccinium) Blake Sh 1m nNA m III
 (S. racemosus Michx.)
 microphyllus Kunth 1818 Sh 3m Mex VIII

SYSTEMATIC BOTANY

BY HENRY K. SVENSON

Plants of the Astor Expedition

The manuscript on the flora of the Galapagos and Cocos Islands, consisting of about eighty pages with six plates, many photographs and text figures, has been completed since early in the spring of 1933 and is awaiting publication. This manuscript does not include the large representation of ferns and fern allies, which comprise about one third of the vascular flora of Cocos and are well represented on the higher islands of the Galapagos Archipelago. I have been working on these with the cooperation of Mr. C. A. Weatherby, of the Gray Herbarium, as an additional project. It was necessary to examine specimens upon which obscure records were based, especially the plants obtained by Darwin on the Galapagos Islands during the voyage of the *Beagle*, and I accordingly went to England for the month of August, at my own expense. This collection is at the herbarium of Cambridge University, where it was made available to me by the kindness of Mr. Gray. With a single exception, all the ferns described by Sir Joseph Hooker from Darwin's collection were located. At Kew I spent a long time in looking up old records, based chiefly on collections by Capt. Wood in 1846, and the miscellaneous notations in Moore's *Index Filicum*. Much valued assistance was given by the curators, especially by Mr. Ballard, who has charge of the ferns.

While at Kew I also made a fairly thorough survey of the genus *Eleocharis*, especially with reference to the species of Africa, Australia, and South America, often poorly or not at all represented in American collections. Several types were also examined at the Linnean herbarium in London and at the herbarium at Edinburgh.

In addition to identifying *Eleocharis* for many institutions, including the U. S. National Herbarium, California Academy of

Sciences, and the Herbarium of the New York State Museum at Albany, I have also been identifying Brazilian *Cyperaceae* for the University of California at Berkeley. There has been the usual routine identification of specimens collected for the herbarium and for exchange with other institutions.

FOREST PATHOLOGY

BY ARTHUR HARMOUNT GRAVES

Chestnut Breeding Work in 1933

The object of this work, which has already been set forth fully in reports of previous years (BROOKLYN BOT. GARD. RECORD 19: 62-67, 1930; 20: 83-87, 1931; and 21: 46-53, 1932) is, briefly, to obtain if possible a chestnut tree to replace the now nearly extinct native chestnut which has been killed off by the blight. Such a new stock should be both blight-resistant and of timber quality, *i.e.* capable of attaining considerable height growth. For the present, our method is to cross-pollinate the blight-resistant Japanese chestnut, a low-growing, orchard type of tree, with the susceptible American timber tree, in the hope of getting, among the offspring of these two parents, the desired combination, that is, a blight-resistant tree of the tall timber type.

During the past year the work has proceeded principally along three lines: 1. The culture of some four hundred young trees and seedlings of various chestnut species and hybrids, including the collection of extensive data on growth rates and habit tendencies; 2. The production of new hybrid nuts of Japanese and American parentage; and 3. The addition of several lots of seeds and seedlings of native American chestnut to our collections, forming the nucleus of a group from which desirable strains may be selected for future work.

1. *Culture of Chestnut Seedlings*

*Hybrids of 1932.**—Of the 189 hybrid nuts produced by the crossing of Japanese and American chestnuts in the summer of 1932, only 65 (34.3 per cent.) germinated. The reasons for this

* We have adopted the plan of naming and dating our hybrids according to the year in which the cross-pollination was effected, although, of course, the nuts do not germinate until the following season.

sharp drop in percentage of germination from the figures attained last year (over 80 per cent.) are not altogether clear. It may be due, in part, to a lack of adequate greenhouse facilities. Also, the poor viability of the seeds may have been inherent. In April and May these 65 seedlings were transplanted to the chestnut plantations on my land at Hamden, Conn. Little more than half their number—37 in all—survived the summer.

The European chestnuts (*Castanea sativa*) received in the fall of 1932 from the botanic gardens of Berlin, Geneva, and Paris, germinated well. Of the 350 nuts received, 176 seedlings (50 per cent.) are now living, 29 in the Hamden plantations and 147 in the nursery of the Brooklyn Botanic Garden. The losses at the Garden were due almost wholly to the depredations of squirrels and rabbits.

A number of seedlings have been grown from nuts of American chestnut collected in various localities and sent to us by interested persons—notably those from Virginia given to us by Miss Hilda Loines.

The Chestnut Plantation at Hamden.—Throughout the growing season considerable time and attention were given to such cultural details as pruning, cultivating, and the control of insect pests. Toward the end of the summer this year the leaves of most of the species and hybrids were attacked by aphids and mites, causing a crinkling and browning of the leaves which was especially pronounced in the latter part of August and in September. Dr. W. E. Britton, of the Connecticut Agricultural Experiment Station at New Haven, kindly identified these attacks as evidently the work of the aphid *Calaphis castaneae* Fitch and of the mite *Paratetranychus bicolor* Banks. It was noted that the thicker, leathery leaves of the Chinese chestnuts (*C. mollissima*) were almost wholly unaffected by these insects.

The area devoted to chestnut trees at Hamden is being enlarged constantly, and some of the trees there are now in their eighth year. As the plantings become more extensive and the trees more mature, the labor involved in their culture is increased, so that it would be most desirable to have the assistance of a gardener for a few days two or three times during the coming summer.

It may be of interest here to state that the plantation at Hamden

is continually exposed to infection from the chestnut blight fungus. The woods surrounding the planted trees contain frequent diseased basal shoots of native trees. This is as it should be. We are not trying to protect the trees from the blight. In order to discover whether or not our hybrids are resistant it is well to have them thus continually exposed to the disease. Eventually—perhaps in two or three years—we shall inoculate all of the older hybrids in order to secure positive evidence on this point. With two or three possible exceptions, where the seedlings have been weakened by drought or some other cause, we have not yet found any of our own hybrids affected with the blight. This is nothing unusual, since such apparent immunity is to be expected in young seedlings. Some of the older Japanese trees have suffered to a slight degree, the infection apparently following winter killing of the tips of shoots. The Chinese trees, now seven years old and in many cases over seven feet high, have remained entirely clear of the blight.

Some of the seedlings in the Hamden plantation, received from the U. S. Department of Agriculture during the years 1929–31 inclusive, blossomed in 1933, as follows:

Number of Trees	Kind	Age
1	<i>C. mollissima</i> (Chinese)	7 years
2	S-8 U. S. D. A. Hybrids (<i>C. mollissima</i> × <i>pumila</i>)	7 “
1	78636 (Japanese)	5 “
1	78627 (Japanese)	5 “
1	F. P. I. (1931) U. S. D. A.	4 “
10	<i>C. Seguinii</i> U. S. D. A.	7 “

With the exception of the shrubby *C. Seguinii*, which bears nuts regularly every year, only one nut was obtained, namely from a Japanese tree of the forest type (No. 78627) received from the U. S. D. A. in 1930.

Other Plantations.—Besides the plantation at Hamden, Connecticut, the following seedlings were given to several interested people, who had them planted on their own land, as follows:

- May 5. 12 *Castanea crenata* to Miss Maud H. Purdy, Pomona, N. Y.
- May 12. 12 *Castanea crenata* to Dr. M. F. Schlesinger, Monroe, N. Y.

May 13. 8 *Castanea crenata* and one pan of *C. sativa* (from Paris) to Mrs. Kenneth B. Halstead, Speonk, L. I.

The Japanese seedlings (*C. crenata*) in this case came from seed obtained in 1931 in Japan by Dr. George M. Reed.

Growth Records for 1933.—We now have a total of 455 chestnut trees at Hamden and in the Botanic Garden nursery, comprising several different species and varieties and hybrids, as follows.

Species	Number
<i>Castanea dentata</i> (American)	17
<i>C. sativa</i> (European)	182
<i>C. crenata</i> (Japanese)	43
<i>C. crenata</i> (Jap. forest type) U. S. D. A.	49
<i>C. mollissima</i> (Chinese) U. S. D. A.	15
<i>C. Henryi</i> U. S. D. A.	3
<i>C. Seguinii</i> U. S. D. A.	10
Folk hybrid (Jap.-Amer.) 1931	1
Hammond hybrid (Jap.-Amer.) 1931	4
Smith hybrid (Jap.-Amer.) 1931	49
Smith hybrid (Jap.-Amer.) 1932	37
U. S. D. A. (various hybrids and species received from Bureau of Plant Industry)	41
Winthrop hybrid 1931	4
Total	455

Table I, below, gives the average growth rates for the hybrids of 1931 and 1932 during the season of 1933. The phenomenal

TABLE I. GROWTH RATES OF HYBRID CHESTNUTS AT HAMDEN, CONN., 1933

Name	Number of Trees	Average Height	
	Living October	October	Average Growth
Folk 1931	1	3 ft. 6 in.	18 in.
Hammond 1931	4	3 ft. 9 in.	21 in.
Smith 1931	49	2 ft. 2 in.	14 in.
Smith 1932	37	7 in.	7 in.
Winthrop 1931	4	1 ft. 7 in.	9 in.

growth of Hammond hybrid No. 86 of 1931, recorded in my report of last year (B. B. G. RECORD 22, No. 2; p. 60) was continued in 1933, the total height growth being about equal to that of the previous year, so that it is at present about six feet high—

an unheard of growth for a two-year-old chestnut seedling. (In a coppice shoot this would not be remarkable.) Most of the trees made two seasons of growth this year, and many of the hybrids of both 1931 and 1932 made three seasons of growth during the same period. This rapid growth is doubtless to be accounted for, at least in part, by the fact that the seedlings are planted in good



FIG. 8. Chestnut bur, four-fifths natural size, containing three nuts and resulting from the cross-pollination of a pistillate flower on the Japanese tree of Mr. Paul Hammond, Syosset, Long Island, using pollen from American trees growing in the Government nursery at Bell, Maryland. (2497.)

garden soil and are kept under clean cultivation throughout the season.

2. Hybridisation Work in 1933

For the hybridization work this year the American chestnut pollen was supplied us, as usual,* through the cooperation of the Di-

*In 1932, since the late-flowering Japanese chestnut of Mr. Renville S. Smith was the only tree worked, we were able to secure our own pollen from native shoots near Lake Mahopac, N. Y., and from New Milford, Conn.

vision of Forest Pathology, Bureau of Plant Industry, of the United States Department of Agriculture, from American chestnuts planted at the Government nursery at Bell, Maryland. For the pistillate trees, *i.e.* the female, or nut-bearing parents, we limited our work to the use of two of the more promising Japanese trees—those of Mr. Paul Hammond and of Mr. John W. Minturn, both at Syosset, Long Island—and to young shoots of American chestnut which we happened to find on the estate of Mrs. James A. Burden. The Minturn tree is a very fine specimen, one of the best in the region, but in past years we have had no success in securing hybrid nuts from it. This year, therefore, we concentrated our efforts on it. As a result, out of a total of thirty-nine hybrid nuts collected in the fall, fifteen were from the Minturn tree. Figure 8 shows, slightly reduced, one of the burs resulting from the cross-pollination of the Hammond tree. This bur, which yielded three nuts, is of unusually large size, about four inches in its median horizontal diameter. The details of the hybridization work in 1933 are summarized in Table II, below. These nuts

TABLE II. ANALYSIS OF CROSS-POLLINATIONS, 1933

	Minturn	Hammond	Burden	Total
No. of branches bagged	60 + 7 selfed	61 + 30 selfed	13	171
No. of flowers pollinated	95	76	32	203
No. of flowers developing				
nuts*	14	15	1	30
No. of nuts ripened	15	23	1	39

* Because of severe storms, we suffered unusual losses of obviously matured nuts.

were all planted in sand immediately after collection, and the pots placed out of doors in cold frames for overwintering.

A notable feature of our hybridization work this year was the use, for the first time, of an American tree as the pistillate parent. Extensive crossings of this type would be very desirable, but heretofore we have been limited to Japanese trees for the female parents of our hybrids, because of the scarcity of flowering American chestnuts in the environs of New York. Good sized shoots (to a

height of ten feet or more) sprouting from the bases of dead chestnut stumps are not uncommon in this region, but few of these shoots bloom, and more rarely still do they bear pistillate flowers. We were particularly fortunate, therefore, in finding near a roadside, on land of Mrs. J. A. Burden, in Syosset, wild saplings of American chestnut (really basal shoots from an old stump), the oldest of these about ten years old and twelve feet in height, bearing several pistillate flowers. These were crossed several times with pollen from the Japanese chestnut of Mr. Minturn, but evidently we misjudged the period of receptivity for the pistils of this species, since from the thirty-two flower clusters (young burs) pollinated, only one nut was matured. We hope that members of the Garden and other interested persons will cooperate in our effort to locate similar American trees at points easily accessible from Brooklyn, in order that this work may be extended, that is, using American trees as the nut-bearing parents.

Observations on Self-sterility.—Continuing our experiments of 1931 (BROOKLYN BOT. GARD. RECORD 21, No. 2; p. 52), further data were collected on self-sterility in the chestnut. Thirty branches of the Hammond tree and seven branches of the Minturn tree, bearing both staminate and pistillate flowers, were bagged before the flowers had opened, and were left undisturbed throughout the blossoming period of the trees, thus presumably insuring self-pollination. None of these inflorescences matured nuts.

3. Plantings of Native Chestnuts

In order to obtain stock for future crossing experiments, and also with a view to the possible selection of disease-resistant strains, we have this fall (1933) planted 202 nuts of American chestnut (*C. dentata*) obtained from various parts of the country; many more nuts have been stratified for planting in the spring of 1934. A list of these plantings follows.

Number of Nuts	Given by	Origin	Date Planted
91 (plus ∞ stratified)	Miss Hilda Loines	Virginia	10/14/33
24 " " "	Mrs. G. Stewart Brown	Liberty, N. Y.	11/23/33
10	Miss Maud H. Purdy	Somerset (?) Co. Pennsylvania	10/19/33
37	Mr. Charles Schlesinger	Pennsylvania	10/19/33
36 " " "	Dr. H. K. Svenson	Western Pa.	11/5/33
4	Mr. J. Stuart Thomson	Snowy Mt., Pa.	10/14/33

Everyone who traveled last fall through parts of New York, New Jersey, and Connecticut adjacent to New York City must have noticed the large number of roadside stands where American chestnuts labelled "native" chestnuts were offered for sale. These brought rather high prices compared with those of the old days: at one place in New Jersey Dr. Svenson bought $\frac{1}{2}$ pint for 35 cents; a pint sold for 60 cents. This high price of the nuts is interesting from at least two angles. In the first place it shows that the nuts, which were everywhere enthusiastically advertised as "native," still retain their old reputation for sweetness and general edibility, and therefore are and will be successful competitors with the imported kinds. In the second place, it shows that in our attempt to breed for a disease-resistant timber tree we should also keep in mind the edible quality of the nuts as well. It is said that the nuts offered for sale at the roadside stands are from points in the southern states where the blight has not yet (presumably) killed out all the native chestnuts.

Cuttings.—At intervals during the year a number of cuttings were taken from various chestnut species, in an effort to find a method of rooting them. Thus far, there have been no positive results.

Herbarium Specimens.—Dried specimens of various chestnut species and hybrids have been collected for a study of the leaf and twig characters, and to serve as a permanent record of the material studied.

Needs.—We are continually hampered in our work for lack of adequate greenhouse space; the poor germination of the hybrid nuts which were secured last year after many days of hard work may have been due in part to a lack of suitable greenhouse conditions. If ultimately we shall have been able to develop a chestnut tree suitable for replacing our lost American chestnut, the expense of a special greenhouse for this particular work will seem slight indeed. I know, of course, that the present is a most inauspicious time to speak of this, yet the urgency of the need is, I think, sufficient justification.

I am glad to have this opportunity to acknowledge with thanks the cooperation of the Division of Forest Pathology, U. S. Department of Agriculture, in this work. I also appreciate the in-

terest and cooperation of Mrs. James A. Burden, Mr. John W. Minturn, and Mr. Paul Hammond, the owners of the trees on Long Island.

ECONOMIC BOTANY

BY RALPH H. CHENEY

Material from the several species of coffee, growing in the tropical plant house, was utilized in a study of the chromosomes in this genus. A study to determine the formation of coffee-leaf glands is likewise in progress.

The summer of 1933 was spent at the Marine Biological Laboratory at Woods Hole, Massachusetts. Studies regarding the effect of alkaloids, especially the methylated xanthines which occur in the genus *Coffea* Linn., were conducted with reference to the animal organism.

REPORT OF THE CURATOR OF PLANTS FOR 1933

DR. C. STUART GAGER, DIRECTOR

Sir: I submit herewith my report for the year ending December 31, 1933.

IRIS PLANTATIONS

Dr. Reed, in charge of Iris, reports as follows:

Many of the newer varieties of Tall Bearded Iris were added to the collection. 116 varieties were received on the basis of exchange from the following:

Mr. Harry Esty Dounce, Bayside, L. I.	4 varieties
Mrs. J. F. Emigholz, Kenwood Iris Gardens, Cincinnati, O. ..	26 "
Mr. Fred R. Whitney, Hudson Gardens, Germantown, N. Y. ..	11 "
Mr. Clint McDade, Chattanooga, Tenn.	14 "
Mr. John A. Monroe, Chula Vista, Cal.	6 "
Mr. Robert Wayman, Bayside, L. I.	25 "
Mr. John C. Wister, Philadelphia, Pa.	30 "

Mrs. Z. G. Simmons, Greenwich, Conn., sent us 17 varieties as a gift.

76 species were added to the collection by exchange from the following:

Mr. F. C. Brown, Royal Horticultural Society, Surrey, England	5	species
Dr. R. A. Harper, Ridgewood, N. J.	6	"
Mr. L. F. Hoyt, East Aurora, N. Y.	1	"
Dr. Fritz Lemperg, Hatzendorf, Steiermark, Austria	4	"
Dr. J. K. Small, New York Botanical Garden, New York City	56	"
Prof. A. E. Waller, Ohio State University, Columbus, Ohio ..	3	"
Dr. O. E. White, University of Virginia	1	"

Mr. S. Tanaka, Shizuoka, Japan, collected plants of 5 additional species in Japan, and forwarded them to us through the Yokohama Nursery Company.

The Oregon Bulb Farms, Boring, Ore., gave us 24 bulbs each of 25 varieties of Bulbous Iris, including Spanish and Dutch.

Three new beds were prepared on the grounds and planted to the Tall Bearded Iris; many of the newer varieties were included in these plantings.

TREES AND SHRUBS

During 1933 we have obtained a few additional plants from nearby nurseries. Species which can be obtained from American nurseries are now nearly all represented in our Garden. A number of trees and shrubs not obtainable in this country were imported from France (Lemoine), Germany (Hesse), and England (Veitch); also bulbs from Holland (Van Tubergen). Rare plants were obtained by exchange from the Arnold Arboretum, Boyce Thompson Institute, U. S. Department of Agriculture, from Mr. Clarence Lewis, and from the Long Island estate of Mr. Anton Hodenpyl. *Clematis* and other plants were obtained from Mr. J. E. Spingarn. Mrs. Nathan S. Jonas presented a large conservatory collection, chiefly orchids.

The Brooklyn Botanic Garden now has a comprehensive collection of trees and shrubs. Further development must be largely of species which require some special attention, for example, as to soil requirements, moisture or shade, or special winter protection. A part of the nursery has been set aside for experimenting with such plants.

From our present list of desiderata of trees and shrubs may be mentioned:

<i>Ardisia japonica</i>	<i>Ilex geniculata</i>
<i>Buckleya distichophylla</i>	<i>Liriodendron chinense</i>
<i>Cotinus americanus</i>	<i>Magnolia macrophylla</i>
<i>Cornus Nuttallii</i>	<i>Nemopanthus mucronatus</i>
<i>Daphne arbuscula</i>	<i>Pseudotsuga japonica</i>
<i>Daphne Giralddii</i>	<i>Pterocarya Rehderiana</i>
<i>Echinopanax japonicum</i>	<i>Sapindus Drummondii</i>
<i>Ehretia thyrsoflora</i>	<i>Sassafras tzumu</i>
<i>Fagus japonica</i>	<i>Sycopsis chinensis</i>

LILACS

The lilac collection, about 250 plants adjacent to the Rose Garden on the west, has of necessity received little attention for a number of years. It was found that various preliminary maps, made before the Rose Garden was constructed, far from represent the present arrangement of the plants. Many shrubs have been moved and many service labels attached to branches have been lost due to borers and other causes. To facilitate accurate mapping of the collection, numbers have been painted on the twenty-eight Rose Garden posts, and a few small boulders have been put in various places to serve as points of reference. New maps have been made by Mr. Joseph Pollio, a CWA draughtsman. Information about plants and specimens has been correlated so far as possible under three groups: White Forms, Colored Single Forms, and Colored Double Forms. We hope to get the greater part of the collection labeled in the spring of 1934.

VIBURNUMS

A geographical arrangement adopted last fall for this important horticultural genus much simplifies the study of the group, and enhances its educational value as an exhibit. We have at present 12 American, 3 European and 22 Asiatic species. These figures reflect, in general, the relative number of species of *Viburnum* in each of the three continents. The *Cornus* and *Spiraea* groups especially need similar rearrangement.

MAPS OF TREES AND SHRUBS

We have adopted a smaller form for our maps with many small squares. These maps are more easily carried about the Garden

and more readily remade, as is often necessary. We expect to have the sources of the plants and year of accession on typewritten lists opposite the maps; thereafter, keeping records of the woody plants will require less time.

COURSES

In the spring I gave an outdoor course of ten lessons on Plant Families continued in the fall by five lessons. The spring lessons chiefly related to the structure of flowers and other characters of the higher plants. In the fall the closing lesson on "Interdependence in Plant and Animal Evolution" was given at the American Museum of Natural History.

VISITS TO OTHER GARDENS

In the spring and again in the fall I visited the Arnold Arboretum at Jamaica Plain, Massachusetts. I also visited the Estate of Mr. Anton Hodenpyl, on Long Island.

LABELS

I have had various consultations with a view to adopting a more permanent form of label. We have abandoned white or yellow paint on the small wooden labels in favor of black on a slightly lighter green background.

Statistical report is attached herewith.

Respectfully submitted,

ALFRED GUNDERSEN,
Curator of Plants.

LABELS AND SIGNS

Labels and signs were made by Mr. John McCallum as follows:

Galvanized iron labels for the herbaceous beds	475
Family labels for the beds	88
Lead labels for the woody plants	288
Small lead labels for local flora and rock garden	574
Small wood labels	495
Large wood labels	19
Wooden signs ...	42
Cardboard signs	278

Total 2,259

Also numerous miscellaneous numbers and signs.



FIG. 9. Conservatory Plaza. North end, showing steps to Laboratory Plaza. The two shrubs between the steps are *Pyracantha*. (8391.)

STATISTICS RELATING TO LIVING PLANTS

Living Plants Received:

	Species or Varieties	Plants
By collection	87	1,329
By exchange	210	419
By gift	281	1,443
By purchase	289	11,671
By seed	550	550
Total	1,417	15,412

Living Plants Distributed:

To members, etc.	6	3,924
By gift	11	20
By exchange	226	226
Total	243	4,170

REPORT OF THE ASSOCIATE CURATOR OF PLANTS
FOR 1933

DR. C. STUART GAGER, DIRECTOR,

Sir: I submit herewith my report for the year ending December 31, 1933.

THE HERBARIUM

From January to March and from October to the end of December the herbarium had the services of two people from the Emergency Work Bureau. They were engaged primarily in mounting and cleaning specimens, in continuation of work which they had done for us the preceding year. The total number of plants mounted was 2,214 which brings the number of sheets in the herbarium of flowering plants and vascular cryptogams to approximately 109,000. By most botanic gardens the herbarium is considered as their most important single feature, representing as it does the basis of plant records in the publications in the library and the accumulated results of years of exploration, and providing the *only exact basis for identification of plants*.

Through the inclusion of the herbaria of the Long Island His-

torical Society dating back to the early decades of the nineteenth century and that of the Brooklyn Institute, our herbarium has much of historical interest as well as widely representative material for the routine identification of plants of the United States. There is great need and desirability of special collections, and I think it should be the policy of the herbarium to develop a few restricted groups rather than a general herbarium. During the past two years we have been especially interested in getting collections of cultivated plants; an adequate herbarium seems the only solution for the present chaotic conditions in the names and identity of cultivated herbaceous plants.

LOCAL FLORA SECTION

With the exception of the limestone ledge still desired for the growth of walking fern, maidenhair spleenwort, and similar rock ferns, the ecological groups may be said to have reached a certain degree of maturity. The grove of young trees planted in 1918 has taken on the appearance of a small forest, in which the interlacing branches provide good shelter for many hundreds of white trilliums, spring beauty (*Claytonia*), hepatica, and violets. Each year substantially improves the woodland conditions by increasing the shade, humus, and aeration of soil. The grove consists of trees planted about 8 ft. apart in a level well-drained area. The trees were of approximately equal size when set out, and were placed with the idea of seeing which species would survive. The rapidity of growth may be roughly seen in the following average measurements made in December 1933 of the circumference at two feet above the ground: *Liriodendron* (17.5 in.), *Quercus rubra* (17.5 in.), *Quercus velutina* (16 in.), *Betula papyrifera* (14 in.), *Fagus grandifolia* (11 in.), *Acer saccharum* (10.3 in.), *Pinus Strobus* (10.5 in.), *Betula lenta* (10 in.). The total number of trees was 65. Of these species *Liriodendron* is by far the fastest growing, although it is probably exceeded in rate of growth by the sweetgum (*Liquidambar*). *Acer saccharum*, *Pinus Strobus*, and *Betula lenta* appear unable to stand the strong competition of the other species. *Betula lenta* and *B. lutea* grow well when removed from competition.

Except for hemlocks and flowering dogwoods which are still

needed throughout the section for ornamental effects, the tree-planting program has been carried out. Within the next decade we should have small stands of red maple, beech, white pine and pitch pine in a flourishing condition, each group accompanied by the characteristic herbaceous plants.

Extension of the boundary fence northward to the pathway coming from Flatbush Ave. has made the section seem more natural and has considerably increased the area. The soil of much of this newly acquired addition has been improved by turning in peat.

The brook, made in the fall of 1932, has become a natural feature of the landscape and provides moisture for the growth of ferns, Virginia cowslip (*Mertensia*) and many species of violets.

In the sand area there has been gratifying success in the growth of two species of *Hudsonia*, *Corema*, *Tephrosia*, *Arcnaria caroliniana*, *Euphorbia Ipecacuanhae*, native species of *Helianthemum*, etc. together with mass plantations of *Viola pedata*. It has been interesting to observe the variations of flowering-time in the native species of blue-eyed grass (*Sisyrinchium angustifolium*, *S. atlanticum*, *S. arnicola* and *S. mucronatum*), and it is expected that the opportunity for similar close observations will give us much information on the relationship of native species within puzzling genera.

The bog has completed its third year and the plants show no sign of losing vitality. Pine-barren plants such as curly-grass (*Schizaea pusilla*), pipeworts (*Eriocaulon compressum* and *decangulare*), *Lophiola*, *Lachnanthes*, *Xyris*, *Drosera filiformis*, *Helonias bullata*, *Sabatia lanceolata*, and several species of orchids are thriving in the wet peat which they share with northern representatives, *Calla palustris*, cottongrass (*Eriophorum spissum*), *Kalmia polifolia*, rhodora (*Rhododendron canadense*), and species of *Carex*. In the adjoining peat-and-sand area *Pyxidanthera* and turkey beard (*Xerophyllum*) are growing luxuriantly. The moist bank adjacent to the bog has for two years supported a good growth of bunchberry (*Cornus canadensis*), creeping snowberry (*Chiogenes*), *Linnaea borealis* var. *americana*, and *Dalibarda repens*, plants confined to mountain regions of our area.

Practically all the desirable plants native within 100 miles of



FIG. 10. Local Flora Section. View facing northwest, showing pool and sand area. *Heliotropis helianthoides* at the right. September 28, 1933. (8508.)

New York City with the exception of the parasitic and semi-parasitic species and those of saline habitats are now growing in the Local Flora Section.

CLASSES

With the help of Miss Rusk, Instructor at the Garden, four sessions on the Native Plants of the New York Region were held (May 16–June 13) at the Local Flora Section and at Coytesville, New Jersey. Beginning January 9th a series of twelve weekly lectures constituting a course of General Botany was given at the Horticultural Society of New York. A repetition of this course was begun on November 13th. An additional series of twelve laboratory sessions on the Identification of Plants, beginning November 13th at the Horticultural Society of New York, was undertaken with the assistance of Miss Rusk.

Statistics from the herbarium will be found appended to this report.

Respectfully submitted,

HENRY K. SVENSON,
Associate Curator of Plants.

HERBARIUM MATERIAL BORROWED FOR STUDY

University of California, Berkeley	28
Mr. C. C. Dean, Bluffton, Indiana	7
Gray Herbarium, Cambridge, Mass.	45
Dr. Fred. J. Herman, Temple University	2
Leningrad, Academie des Sciences de l'URSS	6
Dr. Costa Lima, Jardim Botânico do Rio de Janeiro	16
Missouri Botanical Garden, St. Louis, Mo.	42
New York Botanical Garden	155
New York State Museum, Albany	346
Mr. J. W. Thompson, Seattle, Wash.	38
U. S. National Herbarium, Washington, D. C.	95
Total	780

HERBARIUM MATERIAL LOANED TO OTHER INSTITUTIONS

Dr. N. C. Fassett, University of Wisconsin	43
Mr. Alfred Friedman, Brooklyn College of Pharmacy	18
Dr. Ada Hayden, Iowa State College	112
Mr. Albion R. Hodgdon, Gray Herbarium	236
Mr. John T. Howell, California Academy of Sciences	2

Dr. H. M. Jennison, University of Tennessee	13
Metropolitan Museum of Art (for exhibit)	20
Mr. Harold N. Moldenke, New York Botanical Garden	9
Mr. T. Chalkley Palmer, Media, Pa.	1
Dr. B. C. Tharp, University of Texas	19
Total	473

HERBARIUM ACCESSIONS AND DISTRIBUTION

Phanerogamic Herbarium

Accessions :

By Gift:

Dr. J. A. Drushel	76	
Mr. Max Elwert	1	
Mrs. Mary Holtzoff	105	
Mr. B. A. Krukoff	54	
Mrs. Stephen Loines	1	
Miss Fanny A. Mulford	232	
Dr. Henry K. Svenson	88	
Mr. M. Tatewaki	2	559

By Exchange:

Dr. N. L. Britton	2	
University of California	40	
California Academy of Sciences	10	
Botanic Garden, Cluj, Roumania	177	
Mr. C. C. Deam	234	
Dr. D. Demaree	312	
Dr. N. C. Fassett	1	
Dr. M. A. Johnson, Rutgers University	41	
Miss E. M. Kittredge	10	
New York Botanical Garden	940	
Professor T. Tanaka, Taihoku Imperial Univ., Japan	200	
Mr. J. K. Underwood	3	
U. S. National Herbarium	30	
Mr. Louis C. Wheeler	7	
Mrs. F. G. Whitney, N. Y. State Museum	1	
Mr. Percy Wilson, New York Botanical Garden	1 2 009	

By Purchase:

Miss E. M. Kittredge	42	42
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By Collection:

Dr. H. K. Svenson	1,379	1,379
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Total	3,989	
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Distribution :

By Exchange:

Gray Herbarium	17	
Mr. Ludlow Griscom, Museum Comparative Zoology	3	
Dr. Frederick Grover, Oberlin College, Ohio	235	
Mrs. Edward K. Harrison	12	
Mr. J. T. Howell, California Academy of Sciences	4	
Mrs. Julia Latimer	22	
Mr. T. Chalkley Palmer	1	
U. S. National Museum	3	
Mr. C. A. Weatherby, Gray Herbarium	1	298
Total		298

Cryptogamic Herbaria

Accessions :

*Fungi:**By Exchange:*

Dr. Tr. Savulescu, Bucharest, Roumania	512	
United States Department of Agriculture	171	683

By Purchase:

S. Tanaka, Shizuoka, Japan	130	130
Total		813

*Other Cryptogams:**By Purchase:*

Fr. Verdoorn, Leiden, Holland	100	
Dr. Abel J. Grout, Newfane, Vt.	21	121

By Exchange:

Mr. Aaron J. Sharp, University of Tennessee	191	191
Total		312

No. of Specimens Distributed

By Exchange:

Mr. E. B. Bartram	1
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Seed Packets Received:

By collection	133
By exchange	2,525
By gift	35
By purchase	112
Total	2,805

Seed Packets Distributed:

By exchange	4,367
To members	825
Total	5,192

REPORT OF THE HORTICULTURIST AND HEAD GARDENER FOR 1933

DR. C. STUART GAGER, DIRECTOR.

Sir: I submit herewith my report for the year ending December 31, 1933.

PERSONNEL

The gardening force (nine men) was the same as in 1932, except that we had the services of Mr. Henry Funk from June 5th until the end of the year. Mr. Funk worked without pay for the sake of the experience and his services are greatly appreciated. The laboring force and guards at the gates were maintained substantially as in 1932.

LABOR PAID FOR BY CHARITABLE ORGANIZATIONS

Throughout the year fifty-nine men, whose wages were paid by charitable organizations, worked for a total of 3,955½ days, as follows:

Brooklyn Bureau of Charities	45 men	3,757½ days
Emergency Work and Relief Bureau	12 "	144 "
Brooklyn Ass'n for Improving the Condition of the Poor	1 "	35 "
Good Will Industries	1 "	19 "

59 men 3,955½ days

GENERAL SYSTEMATIC SECTION

Because the plants in the Umbelliferae (Carrot Family) present an unattractive appearance throughout a large part of the year, it was desirable to move the planting from its conspicuous situation opposite the Washington Avenue south entrance and near the walk, to a position to the west where it is partially screened by shrubs belonging in the Cornaceae. Accordingly, three beds near

the Brook were made in the spring for the accommodation of this Family.

In order to obtain better conditions for the gentians, the bed was dug out to a depth of two feet and replaced with new soil.

As the plants in the Hydrophyllaceae (*Hydrophyllum*, *Nemophila*, *Phacelia*, etc.) failed to thrive owing to its sunny location, new quarters were prepared for this family in the shade of nearby Catalpas. The Plantaginaceae, for which there was previously no adequate provision, were planted in the bed vacated by the Hydrophyllaceae.

The area occupied by *Viburnum* was greatly extended—the necessary space being gained by the removal of “filler” material on the adjacent border mound. In the re-arrangement necessitated by this move, opportunity was taken to plant the shrubs in three groups according to their geographical origin, viz. Europe, Asia, and America.

The receipt of a gift of forty boxwood plants in the fall served as a reminder that we had for a long time been debating the desirability of displaying the Buxaceae (*Boxwood* and *Pachysandra*) in a more effective and attractive manner. It was decided to proceed at once with the extension and regrouping of this Family. Accordingly, two new beds were made, each of about 600 square feet. By combining all available species and varieties from the nursery and grounds with the gift, it was possible to adequately furnish these beds.

Six hundred bulbs in thirty varieties of “Ideal” Darwin tulips, the gift of J. J. Grullemans & Son, Lisse, Holland, were planted to take the place of “run-down” varieties in the Liliaceae beds. It may be interesting to record that this gift resulted from the favorable impression made by our display of *Crocus* species and varieties at the International Flower Show in March.

LOCAL FLORA SECTION

An additional area of over five thousand square feet was prepared for planting by digging in about seventy bales of peat moss.

About 275 square feet of flagstone walk was laid and about 100 square feet of ash walk (held together by bituminous emulsion) was made in the vicinity of the southeast entrance.

Trenches were dug for nearly 200 feet of irrigation pipe, which was installed by our own men.

The planting accomplished is noted in the report of the Associate Curator of Plants.

ORNAMENTAL PLANTING

One hundred plants of European Hornbeam were planted on either side of the walk near the north Flatbush Avenue entrance. In order to give the trees a fair chance, the soil was dug and manured to a depth of two feet in two strips three feet wide, each 150 feet long. It is proposed to train these trees to form a pleached alley.

Seven new peony beds, accommodating about 250 plants, were made at the easterly end of the Museum Embankment. The material to furnish these beds was obtained from the peony planting in the Conservatory Garden.

Five thousand plants of English Ivy, propagated here, were set out under the trees on Boulder Hill where the shade is too dense to permit the growth of lawn grass.

The narcissus planting, between the fence of the Experimental Plot and the walk, was removed, the border widened three feet, and planted with various groups of May flowering tulips. Forty-nine varieties were planted—one hundred bulbs of each.

Three new iris beds were made. Two, in the Ecological Section, are each over 800 square feet in area; and one, near the brook west of the Rosaceae, over 400 square feet.

About ninety azaleas in twenty-two varieties were planted to replace dead and sickly specimens in the planting near Empire Boulevard entrance. The soil in this area is not suited to the growth of azaleas and should be removed and replaced with new soil.

Eight young Magnolia trees and a dozen Clematis plants were set out to frame the Laboratory Plaza planting.

CONSERVATORIES

In order to accommodate the gift of Mrs. Nathan S. Jonas of over four hundred orchid plants, house No. 3, which contained a miscellaneous collection of tropical plants, was emptied and con-



FIG 11 Aquarium. One of eight installed in Conservatory House No 8 in March, 1931, to show plants suitable for aquaria (8545)

verted into an orchid house. To make room for the plants, it was necessary to bridge over the walks between the center benches and to construct stepped staging on both side and center benches.

WIND STORM

On August 23d, the Garden was visited by a terrific wind and rain storm. Practically the whole force of gardeners and laborers was occupied for an entire week in cleaning up and repairing the damage resulting from this storm. In most cases, the injured trees and shrubs were not broken off but merely toppled over because the rain-soaked ground failed to hold the roots. This made it possible to pull most of the casualties back to their normal vertical position and stay them with guy wires. It is really amazing that so little permanent injury was done. The only trees of consequence that it was not possible to restore were the Paulownia in the Systematic Section and a large Platanus on Boulder Hill.

MISCELLANEOUS

Fifteen hundred rooted cuttings of Japanese honeysuckle were planted to clothe the new fence around the Experimental Plot.

About three hundred concrete drain "tiles" were made during the winter to be used for the purpose of underdraining the Conservatory Garden.

Two hundred yards of walk near the north Flatbush Avenue entrance was surfaced with Cow Bay Grits held together with a sealing coat of bituminous emulsion.

The old road northeast of the Japanese Garden, which was subject to erosion during every rainstorm, was removed and a new road constructed. This road is 130 feet long and 15 feet wide, made with a stone foundation and a surface of ashes bound with a bituminous emulsion. The new alignment and grade necessitated the construction of a low stone wall on one side which was continued as a stone edging along the fence up to the north entrance of the Japanese Garden—three hundred feet in all.

About five hundred feet of barbed wire fence was replaced at the top of the Museum Embankment.

REQUESTS FOR INFORMATION

Information on request was supplied as follows:

By telephone 298, an increase of 64 per cent. over 1932

In person 206, an increase of 61 per cent. over 1932

By letter 242, an increase of 27 per cent. over 1932

These 746 appeals ranged from requests for prescriptions for sick rubber plants to that of a Brooklyn hospital for the identification of a plant (from a telephoned description) so that a child who had been poisoned from eating a portion of it might be correctly treated. It was easy to decide that the plant in question was the castor-bean. A rather unusual inquiry was from a writer who wanted to know about the possibilities of utilizing insectivorous plants in the home and elsewhere in the control of insect pests!

EXHIBITS

At the Twentieth Annual International Flower Show, the Botanic Garden's Exhibit of Methods of Plant Propagation was awarded the Gold Medal of The Garden Club of America "by the unanimous opinion of the judging committee because of its great value in stimulating knowledge and interest in gardening." This exhibit occupied a space of 30 feet by 12 feet, donated by the Flower Show Committee. Preparation was started more than a year ahead and involved a tremendous amount of work. A description of the exhibit is contained in Brooklyn Botanic Garden *Leaflets*, Series XXI, No. 1, April 5, 1933. In connection with the exhibit, a nineteen page *Leaflet*, "Methods of Plant Propagation" (Brooklyn Botanic Garden *Leaflets*, Series XXI, No. 2-6, April 26, 1933), was prepared, which contains a survey of practices used in the multiplication of plants.

At the same Flower Show, we were awarded a Silver Medal for a labeled collection of about forty species and varieties of Crocus.

At the November 15th meeting of the Horticultural Society of New York, we exhibited

One Vase "Green Rose," *Rosa chinensis viridiflora*
(Award of Appreciation)

and

One Vase *Idesia polycarpa*
(Award of Commendation)

At the meeting of December 20th, we exhibited
Display of Insectivorous Plants
(Botanical Certificate)

COOPERATION WITH OTHER INSTITUTIONS

We cooperated with the Metropolitan Museum of Art by providing much of the living plant material used in connection with the "Exhibition of Plant Forms in Ornament" held at the Metropolitan Museum from May 8 to September 10. The first shipment, which required a moving van, was made on May 4 and included such plants as *Acanthus*, Laurel, Date Palm, European Grape, Olive, and Pomegranate. Thereafter, sixteen additional shipments were made at approximately weekly intervals. The total number of plants supplied was 570, with 41 bunches of cut flowers and branches. Transportation charges were assumed by the Metropolitan Museum of Art.

SEED AND PLANT DISTRIBUTION

In connection with the International Seed Exchange, 5,192 packets of seeds were distributed to foreign and domestic botanic gardens and to other institutions and individuals during 1933.

Surplus plants to the number of 4,170 were distributed to institutions and Botanic Garden members.

PERSONAL ACTIVITIES

I conducted the following "Courses for the General Public" at the Botanic Garden:

Plants in the Home; five talks with demonstrations.
The Fundamentals of Gardening: four of six periods.
Advanced Course in Gardening; seven of ten periods.

I conducted three sessions of a series of twelve weekly lectures, constituting a course of General Botany, which is being given at the Horticultural Society of New York.

I acted as one of the judges for the Federated Garden Clubs of New York State at the International Flower Show, Grand Central Palace, on March 20 and on March 23; Long Island Flower Show of Amateur Gardeners, at Pratt Estate Oval, Glen Cove, June 21; Brooklyn Flower Show, at the Academy of Music, on October 17 and on October 20.

I again conducted the "Garden Guide" column of the New York *Sun*. In this connection, over 1,040 letters were sent out. This work was done, with the permission of the director, outside of regular Garden hours with stenographic assistance and other expenses paid for by the *Sun*.

I served as chairman of the Organization Committee of the proposed American Rock Garden Society, which held several meetings in New York during 1933.

Respectfully submitted,

MONTAGUE FREE,
Horticulturist and Head Gardener.

REPORT OF THE CURATOR OF PUBLIC INSTRUCTION FOR 1933

DR. C. STUART GAGER, DIRECTOR.

Sir: I submit herewith my report for the year ending December 31, 1933.

GARDEN ATTENDANCE

The attendance for the year 1933, as registered at the entrance gates, was 1,315,847, as against 1,307,964 for 1932, a gain of about 8,000. Although this is only a slight increase for the year, it is worthy of note that an attendance much exceeding the record occurred during the months of April, with a total of 205,410, and June, with a total of 181,887. The largest attendance ever before recorded for April was 146,664 in 1931, and for June, 162,960, in 1932. The combined total for April and June of this year was 309,624, about one quarter ($23\frac{1}{2}$ per cent.) of that of the whole year, and almost equal to the attendance for the entire year of 1916, when records of this sort first began to be kept, namely 314,-

990. The attendance at the Garden for the week-end May 6-7 was 33,958. This was the second largest week-end figure ever recorded. (On May 14-15, 1932, the attendance was 38,304.) The combined attendance at classes and lectures was 126,934, as against 128,982 last year.

The attendance at the Conservatories exceeded all past records. During the month of April over 29,000 people visited the collections housed there. This is by far the highest monthly attendance ever recorded. The total for the year was 139,544, as against 123,036 last year. This represents an average of over 11,000 persons per month. I believe that this increased attendance at the Conservatories is accounted for, at least in part, by the completion of the attractive Laboratory Plaza. Visitors who come to inspect this and its various interesting features are attracted to the Conservatories, which are close at hand. The appended table gives the details of attendance month by month.

ATTENDANCE AT THE GARDEN DURING 1933

	Jan.	Feb.	Mar.	Apr.	May	June	July
At regular classes	1,402	1,100	2 508	3,067	3,572	2,775	17,200
At visiting classes	469	564	3,088	5,552	15,130	4,638	45
At lectures to children ...	409	490	2,067	3,046	10,050	3,616	40
At lectures to adults	0	180	90	502	1,060	443	32
At conservatories	7,643	7,335	7,978	29,062	20,374	12,986	7,869
At grounds	72,370	67,518	73,011	205,410	219,517	181,887	105,609
	Aug.	Sept.	Oct.	Nov.	Dec.	Annual Totals	
At regular classes	15,000	3,544	1,508	2,252	1,449	55,377	
At visiting classes	0	25	4,590	6,057	1,271	41,429	
At lectures to children ..	0	205	2,491	3,347	1,100	26,861	
At lectures to adults	0	40	195	600	125	3,267	
At conservatories	9,874	9,176	12,099	9,488	5,660	139,544	
At grounds	95,087	87,852	102,920	73,065	31,601	1,315,847	

SCHOOL SERVICE

During the first half of the year Miss Rusk carried on the work of supplying study material to the high schools, junior high schools, and colleges. She was able to do this in addition to her other work, because of assistance from the Emergency Work Bureau. The work has grown so that without such assistance it could not go on. Therefore, after consultation with officials of the Board of Education, it was decided to make a small charge for materials supplied to the schools, since the latter received an allowance from the City for expenditures of this sort. A price list of materials was prepared and sent to all the schools when they opened in early September.

Miss Julia E. Best, formerly Assistant in Connecticut College, came to the Garden to take over this part of the work, with the title of "School Service Assistant." The table given herewith presents some of the data for this service during the past three years. An interesting point shown is that with this new departure the

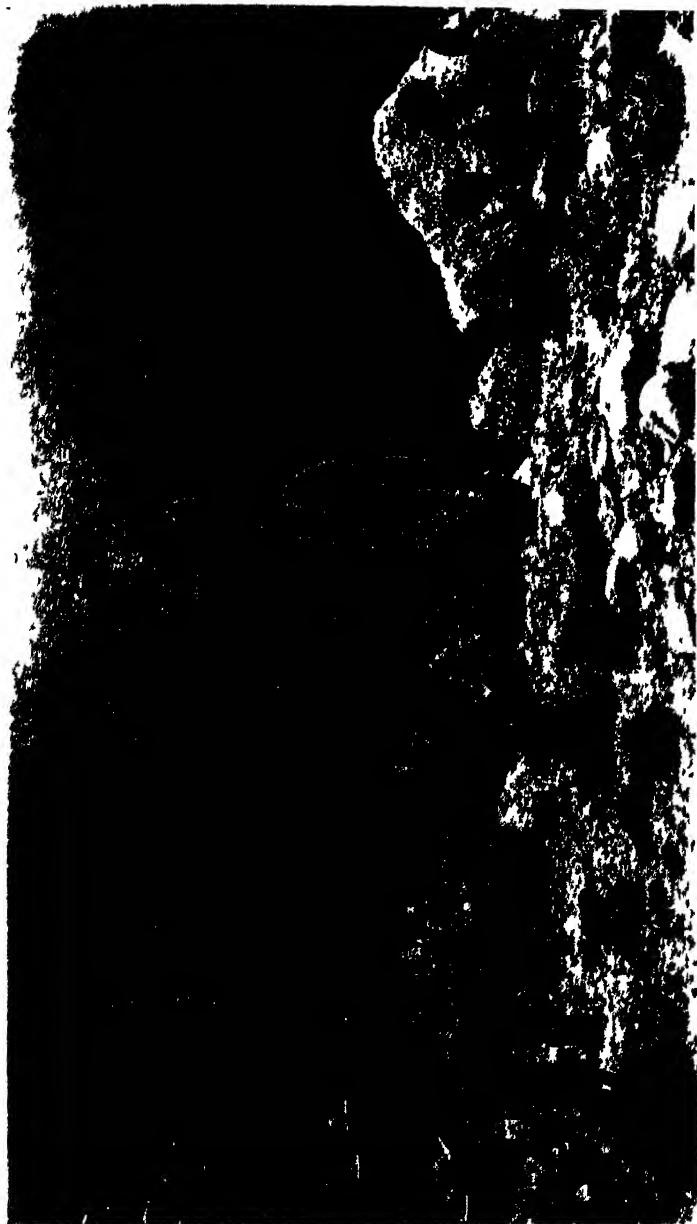
	1931	1932	1933
Total no. of requests for the year	387	398	421
Total no. of requests for January–August	209	215	238
Total no. of requests for September–December ..	178	183	183
No. of petri dishes filled during year	5482	5727	4888
No. of petri dishes filled January–June	2873	3664	4265
No. of petri dishes filled September–December ..	2609	2063	623

number of requests for material in 1933 actually increased.

The decrease in number of petri dishes results partly from a complete loss of requests from certain schools, and partly from a reduction in number of petri dishes per school. The schools which no longer ask for petri dishes include 8 high schools, 4 of which are known to be preparing their own, 9 junior high schools, and 1 parochial school. We are very glad of the relief thus afforded this department, our object being to meet school needs not otherwise provided for.

ADULT CLASSES AND COURSES

New Courses.—The popularity of the new course in "Flower Arrangement" (A23), given in January, 1933, and sponsored by the Woman's Auxiliary, was attested by the large enrollment—108



F. c. 12. Portion of Cactus exhibit, Conservatory House No. 6. *Opuntia* (6 species), *Echeveria metallica*, *Echinocactus horizontalis*, *E. Grisoni*, *Artocarpus fissuratus*. (8548.)

persons. Miss Mary Averill, Mrs. William H. Cary, and Miss Maude Mason were the lecturers. Another new course was "The Child and his Garden" (A24), conducted by Miss Ellen Eddy Shaw and given in January and February. This was designed particularly for parents and their children.

The "Fundamentals of Gardening" (A25), although described in the Prospectus for the first time in 1932-3, had been given in 1932 under the name of "Elementary Gardening" and announced in a circular issued in the fall of 1931. Eighty-eight persons enrolled in this course this year. The course was given by Miss Shaw and Miss Dorward.

Seventy-two persons attended one or more of the "Three lectures and demonstrations for teachers" (A27), offered this fall for the first time, the lectures being given by Miss Shaw, Miss Jenkins, and Miss Miner.

Courses on Trees and Shrubs.—One hundred and eight persons registered for this course—86 for the spring part and 22 for the fall. The spring group was divided into three sections of about 28 each. This is now listed (beginning with the 1932-33 Prospectus) as a "B" course, that is, one of those designed particularly for teachers, who may thus earn credit for higher teaching licenses. One reason why there was such a large enrollment in the spring, in contrast to the small registration this fall, was that the course was also listed in last year's Prospectus as an "A" course, free to members of the Garden.

General Botany (B1).—This course was conducted by Miss Rusk, as usual, the subject for this year (to Sept. 1933) being the higher plants. Beginning in September the lower plants have been the topic. The arrangement of alternating lower and higher plants in successive school years began in 1931.

The course for nurses in training (D1) was given in the spring and fall under my direction, as usual. In the fall the class studied sixty-three species of medicinal plants, using the plants in the outdoor plantations, in the Conservatories, and in the herbarium. The classes came from Kings County, Prospect Heights, and St. Johns Hospitals—44 students in the spring and 77 in the fall. At the conclusion of both spring and fall courses a lecture on drugs was given by Mr. Jonathan Gordon, a graduate of St. Johns Col-

lege of Pharmacy, class of 1932. This lecture dealt with the methods by which pharmacists recognize drugs macroscopically and microscopically, the preparation of drugs, tinctures, fluidextracts, etc., and the biological and chemical methods of standardization of important drugs.

It would be a feature of distinct advantage, not only to these classes but also to the general public, if at some time in the near future a small area such as the triangular plot just west of the Rose Garden could be devoted exclusively to medicinal plants. Such collections are an important and integral part of many European botanic gardens.

The total number of persons registered in the adult courses for 1933 was 823, as against 908 last year. The figures for the last few years are as follows:*

Year	Persons Registered
1929	764
1930	802
1931	823
1932	908
1933	823

FLOWER DAYS

The flower days were continued as usual this year. These are informal occasions at which the members of the Garden and their friends are afforded an opportunity to see, under guidance, those collections which are of outstanding interest, and to view them when they are at the height of their flowering period. Several days in succession were devoted to the Japanese Iris, under the guidance of Dr. Reed. This was a departure from the usual custom, and has the advantage that it offers additional opportunity to those who might not be able to attend if only a single day is selected. The exercises were well attended, averaging about 150 for each occasion. The social arrangements were in charge of the Woman's Auxiliary, assisted by the young women of the Garden personnel. We would like to avail ourselves of this opportunity to acknowledge our indebtedness to both of these groups

* These figures differ from those of previous reports because registration in the full-year courses is here counted according to the calendar year rather than the school year as formerly.

for their continued interest and invaluable services. A list of the "Days" for the year 1933, with the leaders, follows.

Tuesday, March 21. Crocus Day. Mr. John C. Wister, President of the American Iris Society and Director of the Arthur Hoyt Scott Horticultural Foundation at Swarthmore College.

Friday, June 2. Iris Day. Dr. George M. Reed, Curator of Plant Pathology, Brooklyn Botanic Garden.

Tuesday, June 13. Rose Garden Day. Mr. Montague Free, Horticulturist, Brooklyn Botanic Garden.

Tuesday, Wednesday, and Thursday, June 20, 21, and 22. Japanese Iris Days. Dr. George M. Reed.

Tuesday, October 10. Fall Rose Garden Day. Mr. Montague Free.

EXHIBITS

1. *Methods of Plant Propagation*.—At the International Flower Show, Grand Central Palace, Manhattan, March 20–25, 1933. The Horticulturist will give a more detailed report on this exhibit, of which he had entire charge. This department sent out descriptive announcements of the exhibit to the biology departments of all New York high schools. An account of the exhibit was also prepared and sent to the principal horticultural journals.

2. *Exhibit at Herold's Pharmacy*.—In June, 1933, we supplied the following specimens of living and dried plants for an exhibit of drug plants at Herold's Pharmacy, 837 Franklin Avenue.

Hamamelis virginiana

Lobelia inflata

Atropa Belladonna

Veratrum viride

Gaultheria procumbens

Prunus scrotina

Datura Stramonium

Cinnamomum camphora

Piper nigrum

Olea europea

Also mounted specimens of the following: *Digitalis purpurea*, *Cinchona rubra*, *Papaver somniferum*.

3. *Exhibit at Namm's Store*.—October 2–11. As a part of the series of exhibits entitled "Brooklyn Days," given by Namm's Store, we were invited to install an exhibit representing activities of the Brooklyn Botanic Garden. At this exhibit bulb planting was featured, and under Miss Shaw's direction one of the young women employees of the store conducted a window demonstration of the various steps to be taken for the correct planting of bulbs

both indoors and out. The principal other items of the display were: model of the children's gardens, terrarium, Wardian case, material distributed to schools, results of research in genetics, publications of the Garden.

EDITORIAL WORK AND PUBLICITY

As usual, I continued to serve on the editorial board of the *American Journal of Botany*, as editor of the Plant Section of General Biology for *Biological Abstracts*, as editor of the Brooklyn Botanic Garden *Contributions*, and as associate editor of the *Bulletin* of the Torrey Botanical Club. As editor of the Brooklyn Botanic Garden *Leaflets* I report that eight numbers were issued, as follows:

- No. 1. The Brooklyn Botanic Garden Exhibit of Methods of Plant Propagation, International Flower Show (N. Y. City), March 20th-25th, 1933. By Montague Free.
- No. 2-6. Methods of Plant Propagation. By Montague Free.
- Nov. 7-8. Hay Fever—a Study in Applied Botany. By August A. Thomen, M.D.

We continued the method that we have followed for the last ten years, of sending news releases telling of Garden events of particular interest to the public. For 1933, seventeen releases containing twenty-nine articles were mailed to the principal metropolitan newspapers. In addition, releases dealing particularly with the activities of the Woman's Auxiliary of the Garden were sent to the press by the Brooklyn Publicity Bureau. A total of 1,495 clippings of articles relating to the Brooklyn Botanic Garden were received, as against 1,564 last year.

MISCELLANEOUS ITEMS

Personal Activities of Other Members of the Department.—During the summer Miss Hester M. Rusk, Instructor, collected and preserved a large number of specimens of weeds of the New York region, with a view to making a study of them during the winter. She also attended Ohio State University during the second term of the summer quarter, particularly for the purpose of observing methods of teaching botany. In December she attended

the meetings of the A. A. A. S., and the Botanical Society of America in Boston. In July and August Miss Hilda Villkomerson, Curatorial Assistant, attended a six weeks course on the Taxonomy of Vascular Plants conducted by Professor K. M. Wiegand in the Summer School of Biology of Cornell University.

Postcard Bulletins.—During the year postcard bulletins were sent to members of the Garden early in March telling of the seed catalogs available for consultation in the library; on March 17, telling of the Garden's exhibit of plant propagation at the International Flower Show; on April 3, announcing a demonstration of methods of pruning roses in the Rose Garden; on May 20, telling of the distribution of over 1,000 young chrysanthemum plants to members; and on October 20, acquainting members of the distribution of 1,000 divisions of named peonies.

Staten Island Inspection Work.—In company with Mr. W. Lynn McCracken, Secretary of the Staten Island Conservation Commission, I have inspected the areas on Staten Island which are included in the regional planning for the island, and have made suggestions regarding the location of the proposed botanic garden for Staten Island.

Lantern Slides of European Gardens.—From photographs I took on my trip to Europe last year, I have had made and colored one hundred and thirty-three lantern slides. These comprise views of interesting plants, floral displays, and other noteworthy features of public parks and botanic gardens in Europe.

Broadcasts.—Beginning in October, I have broadcast over WNYC regularly, every two weeks, talks dealing with some feature of the Brooklyn Botanic Garden.

General Information.—As in former years, this department has answered numerous inquiries by telephone, in person, or by mail, for information or advice concerning plants.

Research Work.—I have continued the work of hybridizing Japanese and American chestnuts with a view to securing a disease-resistant chestnut tree suitable for timber. A report of this work will be found on pp. —.

Respectfully submitted,

ARTHUR H. GRAVES,
Curator of Public Instruction.

REPORT OF THE CURATOR OF ELEMENTARY INSTRUCTION FOR 1933

DR. C. STUART GAGER, DIRECTOR.

Sir: I hereby present my annual report for the Department of Elementary Instruction for 1933.

I would like to call your attention to a few outstanding facts in relation to different phases of the work of this Department.

In our work with children, including all its branches of service, we have contacted approximately a million young people.

In Brooklyn alone we have reached 204 elementary schools, about 90 per cent. of the entire number in the Borough; 7 junior high schools, 23 high schools, 1 university, 15 private schools, and 23 parochial schools.

On January 7, a class was started called "The Child and His Garden." This was for both mothers and children and had a registration of 22 children and 13 mothers. It was conducted on Saturday mornings before the regular Saturday morning work began.

During January and February special courses were given for Berkeley Institute and Brooklyn Ethical Culture School. This is the first year we have carried on special group studies during the early months of the year. The work for the Ethical Culture School continued throughout the entire spring term and ended with a remarkably fine exhibit set up in our rotunda. This exhibit demonstrated how the nature work they took with us had been the keynote of all their work for the term. The work with Berkeley continued through most of the spring. From this special series planned for private schools, partly an outgrowth of the course, "The Child and His Garden," and partly through our own work, courses were planned in the fall for Berkeley, Packer, Ethical Culture School, Miss Kirk's School, and the Prospect School. These courses varied in length from two to eight weeks and were highly satisfactory.

In early February a class was started for new children who wished to join the Boys and Girls Club. These children were on probation, becoming acquainted and preparing themselves for the regular spring classes.

There were 218 boys and girls registered in the spring classes, which this year were divided into two distinct units, one beginning the 25th of March and running for six weeks, taking up lessons in planting of seeds, testing of soil, and acquaintance with the grounds in the spring, while the second unit began on the 22d of April and worked entirely upon their plans and studies of vegetables and flowers preparatory to the outdoor garden project. These classes rotated from one instructor to another for better acquaintance with instructors and to carry on the Departmental work in a richer way.

June, July, August, and September were spent in the outdoor garden with a registration of 235 students.

In our fall classes, the registration figure was 185.

Our teachers' classes were carried on as usual. This year two series of special free lectures for elementary schools were given at the Botanic Garden, one in the spring and one in the fall. At our spring series 18 elementary schools from Brooklyn and 14 from Queens participated, with Abraham Lincoln High School and Kings County Hospital also represented. In the fall were registered 32 elementary schools from Brooklyn, 6 from Queens, Wadleigh High School, the Manhasset School, and Miss Beard's School of Orange, N. J.

I would like to draw to your attention the enormous amount of detail which is involved in the work of this Department, detail which has grown tremendously in the last few years and which has been handled efficiently and cheerfully with the same sized staff. Much of this work might easily be handled by someone less experienced and less well-trained than the instructors in the Department. Two thousand seven hundred ninety-three plants have been given out to 119 different institutions, including elementary schools, high schools, junior high schools, colleges and universities, private and parochial schools, and other institutions. Six hundred eight plants were placed in 74 different classrooms. More than 3,000 surplus perennials and annuals raised in our green-houses were supplied to 33 different institutions. Twenty-five collections of house plants varying in number from 8 plants to 20 were distributed to different schools, not for decoration, but for study.

The Department set up 19 exhibits. These were viewed by about 500,000 people, and included exhibits put up in schools, at the Children's Science Fair, and at the Namm Store.

More than 1,200 people received instruction in our greenhouses. In January of last year our greenhouses had in them about 5,000 plants. These plants, representing stock material, have been raised entirely by the Department this year. Most years we purchase some new stock, but this year every effort has been made to reduce the expenditure, which, of course, has increased the amount of detail work.

A course called "Fundamentals of Gardening" was given by Mr. Free and myself, I giving the two greenhouse lessons in the course.

During the spring we took over the planning and execution of the spring docentry for outside visiting clubs. This took up a great deal of time and energy of the members of the Department. From fifteen volumes of the *National Geographic Magazine* which had been presented to us, instructors in the Department sorted out, by subject, articles pertaining to plant life and geographic lore and bound up 72 volumes in small editions.

The penny-pocket seed work was carried on as usual. It might be of some interest to note that about 1,000 pounds of seed are bought, envelopes filled, and seed orders packed and counted out. This work takes most of the time of one of the instructors from November to May, and during the summer when a great deal of the filling of seed is done by the boys and girls of our outdoor garden.

The children's garden was carried on as usual, and it is to be noted that, notwithstanding the financial situation in our country, more children left the city for long vacations, for camp and country, than ever before in the history of the garden, thus making garden attendance irregular. Through a gift of money from Mrs. Charles E. Perkins, it was possible for us to have some extra help on the Silver Pin work which is one interesting feature of our summer's work. A new feature of our garden this year was a little course in the study of flower arrangement. This group of students kept the house supplied with flowers and made up bouquets every week. Flowers were sent up to the Labora-

tory Building for the office and the library, and besides that, bouquets went home to the children's parents. July 12 was the annual visiting day for parents. Each mother received some lavender raised in our garden and each father a flower for his buttonhole.

Other groups visited us during the summer—a class from New York University and a group of women from Cedarhurst, where a garden according to the plan of our garden was started by the mothers of two of our garden boys who come from there. This was started in connection with one of the local elementary schools, and in the fall, the Curator visited this garden at their final meeting, and presented some of the prizes.

The Shakespeare Garden had no new additions, but was carried on effectively. Twenty bronze and twelve silver medals were presented at our annual party in the fall. Pictures were taken of different operations in the spring and during the summer and fall by our photographer, Mr. Buhle, and a very excellent new set of lantern slides was made and colored. This was financed by a gift made sometime ago by the Woman's Auxiliary.

During the spring the Head Garden Teacher gathered together material for an exhibit representing all phases of our children's work. This is ready to be set up at a minute's notice.

In May the Plant, Flower and Fruit Guild of Brooklyn presented a sum of money to buy hydrangeas for the urns placed in front of the children's garden house. These were presented and dedicated on May 5 in loving memory of Mrs. M. C. Plough, former secretary of the Brooklyn Plant, Flower and Fruit Guild.

In November we invited the schools having school gardens to meet at the Garden for an annual survey of their work. At this time a child delegate from each school spoke, telling of some unusual feature in his own school garden. There were forty schools invited to attend this meeting.

The number of conferences this year has been far greater than during 1932. Over 200,000 children were reached through conferences with teachers and principals.

Dr. William G. Vinal of the School of Education, of Cleveland, Ohio, took one of our regular nature study periods (B2) this spring.

Because of the conditions of the times I shall not present to you any needs from this Department or any requests for extra help or for expenditures.

The first week in July I attended the National Education Association meetings at Chicago and took charge of the meetings of the Department of Science Instruction of which I am President. In October I was invited to go to Rockford, Illinois, to speak before the Winnebago County Institute of Teachers on the methods by which we carry on our children's work. At the December meeting of the American Nature Study Society with the American Association for the Advancement of Science in Boston, Miss Jenkins, of this Department, spoke on "By-products of a Children's Garden." The new set of lantern slides, of which I have spoken before, had their christening at this time.

I was asked to serve on the Advisory Board of the Horticultural College of Southern California, affiliated with Pasadena Junior College; and as chairman of the Nature Craft Committee of the Brooklyn Camp Fire Girls. I also continue to act as Honorary Secretary of the National Plant, Flower and Fruit Guild. During the year I wrote thirty-eight articles for the Garden Page of the *New York Sun*, and eight articles for *McCall's Magazine*.

Since 1933 represents twenty years of my work in the Department of Elementary Instruction, I would like to mention a few facts concerning this Department. Its broad plans were laid down by the Director before I was chosen to start the work. It has been my great privilege to take these plans and without any change in the lines originally laid down to interpret and to enlarge upon them as work and opportunity dictated.

In looking back over the history of these twenty years, I would like to review some of the early years. I came to the Garden on October 1, 1913. On October 6 my first class was taught, a class from the Girls' High School, seventeen girls to be instructed in the indoor planting of bulbs. This represents the beginning of visiting classes, and from that figure of 17 girls in the fall of 1913 we come to the fall of 1933 with an attendance at visiting classes of more than 68,000. There was one greenhouse in 1913. In it, during that month of October I gathered together for lecture purposes 8 plants. We now have three instruction greenhouses

built according to our own plan, with plants ranging in number from 5,000 to over 10,000 or 12,000 in the season when we have young seedlings.

Those eight plants referred to represent the beginning of work for adults. A short lecture course was started on October 28, 1913. This course was held in what is now the children's club-room, the only lecture room we had at that time. Now our courses for adults are many and varied.

In January, 1914, teachers' classes were started with seven young women, the beginning of all the work we now offer to elementary and high school teachers. We have 355 teachers registered in our teachers' classes for 1933.

Seed work was started in 1914, when we filled about 25,000 packets of seed, stamped the name of the seed on a plain Manila envelope, and used thimbles as fillers. We now have an adequate, well-stocked, well-arranged seed-room where over a million packets of seed are filled annually.

From a single principal's coming to discuss plans for his school with me in October of that first year, the year of 1933 represents a total number of conferences reaching 9,000.

The children's outdoor garden was started in 1914 on the piece of land now occupied by our main building and the strip of land upon which the instruction greenhouses now stand. This land was used for 60 children coming from the practice school of Pratt Institute and as a practice garden for junior and senior students of Pratt Institute Kindergarten Department. The main garden, with its 80 children, was the garden training school for the young women students at the Brooklyn Botanic Garden. It was the mother of our present garden which accommodates over 200 boys and girls.

There are two main aims in our children's work, one to instill in the minds of numberless children a love and appreciation of the outdoors; the other, a hope that from these boys and girls, especially from those in our Saturday morning classes, there may develop a contribution to science from some outstanding young person in the field of botany. Twenty years is not long enough to tell this story; but at the present time we have the following of our young people connected definitely with the subject of

botany—one an Assistant in Botany at Columbia University; one an Assistant in the Research Department of the Brooklyn Botanic Garden; one completing a research project for his Ph.D. at Harvard University; one engaged in research work for the Port of New York Authority with the Federal and State Departments of Agriculture and Commerce. Among college students, we have one in landscape design at Syracuse University; one in the College of Agriculture at Cornell University—and I would like to mention here that in his case the practical work he had done in his student days at the Brooklyn Botanic Garden was accepted at Cornell University as practical work toward his degree. Still another student is working in agricultural chemistry at Long Island University. At St. Francis College is a young man preparing to be a teacher of botany. We have had one young woman who has shown outstanding ability in the field and has recently received a scholarship from the Farm and Garden Association for Amherst Agricultural College. Of three young women who started to prepare in botany to enter a career of education, one is married, and two have been obliged to teach other subjects because of the demands of the times. Most of these students are recipients of the Alfred T. White Scholarship, provided for by the late Alfred T. White to encourage young people in the study of botany. There have been fourteen of these young people, and out of the fourteen, nine are in the field of botany or in an allied field. Six boys and girls at present registered in our Saturday classes are planning to enter the field of botany.

The long period of attendance of some of our boys and girls at the Garden is noteworthy. I have in mind a lad who came here at five, continued with us until he graduated from New York University, and still, as a senior in the Dental College of the University of Pennsylvania, comes to see us in his holidays. We have this year two seniors at Princeton University, one of whom came to us when he was eight years old and continued until he left for college. It is no unusual thing for us to have boys and girls who register almost in babyhood and continue to come until they reach college age. One of the Alfred T. White Scholarship recipients, a graduate of St. Joseph's College and now a Laboratory Instructor, came at the same early age, stayed with us through her

college years, and has never broken her definite working relationship with us. The same thing is true in some of our teachers' classes, that year after year, many teachers come back for the pleasure and enjoyment of these classes.

This would perhaps be a fitting occasion for me to express thanks to the Trustees, the Governing Committee, to the Director of this Garden for the untrammelled opportunities I have had in my twenty years of work at the Brooklyn Botanic Garden.

Respectfully submitted,

ELLEN EDDY SHAW,
Curator of Elementary Instruction.

REPORT ON THE LIBRARY FOR 1933

DR. C. STUART GAGER, DIRECTOR.

Sir: Because of the continued absence of the librarian, on account of illness, the report on the library for 1933 is submitted by the assistant in charge.

ACCESSIONS

During the year 1933, 455 volumes and 613 pamphlets have been added to the collection, aggregating 17,906 volumes and 14,100 pamphlets, a total of 32,006 pieces. Of these, 157 volumes and 329 pamphlets have been received as gifts, in addition to the current numbers of 88 periodicals. The following are especially noteworthy:

Given by their respective authors:

Cary, Katharine T. and Nellie D. Merrell. Arranging flowers throughout the year. New York, 1933.

Ikeno, Seiitiro. La Verkaro botanika . . . Tokyo, 1933.

White, Alain and B. L. Sloane. The Stapelieae. Pasadena, Calif., 1933.

Given by:

Mr. Herman Becker.

Schlechter, R. Orchideen. Berlin, 1915.

Brooklyn Botanic Garden Boys' and Girls' Club.

Wallace, Alfred Russel. Palm trees of the Amazon. London, 1853.



FIG. 13. Overlook at north end of Rose Garden. View facing southeast. September 16, 1933. (8544.)

Brooklyn Botanic Garden Woman's Auxiliary.

Anonymous. Morihana. (Modern influence in flower arrangement.) Tokyo(?). 1933(?).

Hine, Mrs. Walter R. Arrangement of flowers. New York, 1933.

Estate of Dr. Arthur Hollick.

New York Academy of Sciences. Annals. Vols. 1-31. 1879-1929.

New York Academy of Sciences. Transactions. Vols. 1-11. 1881-1892.

Staten Island Association of Arts and Sciences. Proceedings. Vols. 1-7. 1907-1918.

Miss C. Julie M. Husson.

Le Bon Jardinier. Paris. 1885. 3 vols. Illustrations by Decaisne and Herincq.

Miss Hilda Loines.

Kado Zenshu. (On Japanese flower arrangement.) Vols. 2, 4, 6, 10. Tokio, 1933.

A complete list of donors will be found in Appendix 1.

Fortunately for the collection the number of periodicals received through exchange with our own publications has materially increased this year. The loss of certain institutions and titles from our list, as explained in the last annual report, was a temporary one and we have added a few new names. We have now a total of 756 publications on an exchange basis, nearly 100 more than in 1932, and 68 more than in 1931. This covers the discrepancy between the number received as gifts in 1932 (105) and in 1933 (88). The total number of serial publications is at present 979, an increase of 76. Of the 455 volumes added, over 200 were sets or runs completing periodicals and 44 were for use in the Boys' and Girls' Club Room and Garden House.

LIST OF SOME IMPORTANT ACCESSIONS

Autograph Letters

Gray, Asa. Vries, Hugo de.

Books

- Autran, Eugène and Durand, Théophile. Hortus Boissierianus. Genève, 1896.
- Candolle, A. P. de. Plantes rares du Jardin de Genève. Genève, 1829. Author's presentation copy. Contains a letter and inscription to Mlle. Anastasia de Klustine, dated 20 Nov. 1830. Letter signed A. P. de Candolle.
- Chaney, R. W. and Sanborn, E. I. The Goshen flora of west central Oregon. Washington, D. C., 1933.
- Courtois, Richard. Commentarius in Remberti Dodonaei Pemptades. 1833.
- Crescenzi, Petrus de. De agricultura vulgare. Venice, 1511. (Third Italian edition.) From the library of William Morris, with his bookplate.
- Dal'Horto, Garcia. Dell' historia dei semplici aromati. Venice, 1597.
- Darlington, C. D. Recent advances in cytology. Philadelphia, 1932.
- Dioscorides, Pedacios. De materia medica libri sex. Venice, 1518. Second edition of Dioscorides in Greek.
- Dioscorides, Pedacios. Opera quae extant omnia. Ex nova interpretatione Jani-Antonii Saraceni. . . . [Lugduni et Frankfort], 1598.
- Dobell, Clifford. Antony van Leeuwenhoek and his "little animals." Amsterdam, 1932.
- Dodoens, Rembert. Cruydeboeck in den welcke die gheheele historie, dat es tgheslacht. . . . Antwerp, 1554. (First edition.)
- Eisai. Hanoshobu Zufu. (Series of 100 paintings of Iris, copied from the original by Bunkio Matsuki, by permission of the Imperial Library, Ueno Park, Tokyo.) 1930.
- Dorf, Erling and Webber, I. E. Studies of the Pliocene paleobotany of California. Washington, D. C., 1933.
- Evelyn, John. Directions for the gardiner at Says-Court. . . . Nonesuch Pr., 1932.
- Gabrielson, I. N. Western American alpine. New York, 1932.
- Gerarde, John. Catalogus arborum, fruticum, ac plantarum . . . in horto Johannis Gerardi . . . nascentium. London, 1599. Second edition of the earliest catalogue of an English garden.
- Gray, L. C. and Thompson, E. K. History of agriculture in the southern United States. 2 vols. Washington, D. C., 1933.
- Guilliermond, Alexandre and others. Traité de cytologie végétale. Paris, 1933.
- Hanmer, Thomas. The garden book of Sir Thomas Hanmer, Bart. London, 1933.
- Hedwig, Joanne. Filicum genera et species. . . . Lipsiae, 1799.

- Hedwig, Joanne. *Theoria generationis . . . plantarum cryptogamicarum*. . . . Petropoli, 1784.
- Heidel, W. A. *The heroic age of science*. Washington, D. C., 1933.
- Higgins, Vera. *The study of cacti*. London, 1933.
- Humboldt, Alexander von and Bonpland, Aimé de. *Plantae aequinoctiales*. . . . 2 vols. Paris, 1808-09.
- Hurst, C. C. *The mechanism of creative evolution*. Cambridge, 1932.
- Jacobson, H. P. *Fungous diseases*. Springfield, Ill., 1932.
- Jacquín, N. J. *Miscellanea Austriaca*. . . . Vienna, 1778-81. 2 vols. in 1.
- Jussieu, A. L. de. *Genera plantarum*. . . . Paris, 1789. (First edition.)
- Laurie, Alex and Chadwick, L. C. *The modern nursery*. . . . New York, 1931.
- Linné, Carl von. *Bibliotheca botanica. Editio nova*. Halae, 1747.
- Linné, Carl von. *Systema naturae*. Lugduni Batavorum, 1756.
- Miquel, F. A. G. *Annales musei botanici Lugduno-Batavi*. 4 vols. Amsterdam, 1863-68.
- Miyoshi, Manabu. *Atlas of Japanese vegetation*. 15 pts. Tokyo, 1905-14.
- Praeger, R. L. *Sempervivums*. London, 1932.
- Read, C. B. *Fossil floras of Yellowstone National Park*. Washington, D. C., 1933.
- Robbins, W. W. and Pearson, H. M. *Sex in the plant world*. New York, 1933.
- Sansome, F. W. and Philp, J. *Recent advances in plant genetics*. Philadelphia, 1932.
- Schaeffer, J. C. *Fungorum qui in Bavaria . . . nascuntur*. V. 1-2. Ratisbon, 1762-63. (First edition.)
- Targioni-Tozzetti, Ottaviano. *Istituzioni botaniche*. Firenze, 1802. 3 vols. (Second edition.)
- Tornabene, Francisco. *Hortus botanicus*. . . . Catinae, 1887.
- Turck, F. B. *The action of the living cell*. New York, 1933.
- Tusser, Thomas. *Tusser redivivus*. London, 1710.
- Vickery, H. B. and others. *Chemical investigation of the tobacco plant*. Washington, D. C., 1933.
- Wallace, A. R. *Island life*. London, 1880. (First edition.)
- Watt, George. *Dictionary of economic products of India*. V. 2. Calcutta, 1889. The personal copy of the author, fully annotated. Contains an autograph letter to Professor Watt, signed "Prof. Flückiger."
- Watt, George. *Rhea or China grass*. (Agricultural Ledger.) Calcutta, 1898.

Periodicals

- Botanische Zeitung*. V. 1-68. Set completed.
- Fedde. Repertorium specierum novarum regni vegetabilis*. V. 1-33. Complete to date.
- Kühn-Archiv*. V. 1-32 (to date). Set completed.
- Nature*. V. 1-132 (to date). Set completed.
- Zeitschrift für pflanzenkrankheiten*. V. 1-8. (We have also V. 18-43, to date.)

SPECIAL WORK OF THE LIBRARY

The reduction of the budget and of special library funds meant a corresponding loss in the number of books purchased, so the volume of general routine was somewhat lessened. No binding of books or periodicals was attempted until the last week of the year, when we were able to send about 300 volumes to the binder.

Two workers from the Emergency Unemployment Relief Committee were kept busy through the winter, and one other has been with us the entire year. In addition to these, a volunteer worker, a graduate from a library school, needing experience, came four days a week from October to December. With this help the library assistants covered the regular routine and in addition accomplished the following special work:

1. An inventory of the pamphlet collection was taken and the pamphlets moved to the lower stack room.

2. The Pre-Linnean collection was checked and a special list made.

3. About 2,000 catalogue cards were re-typed as the old subject headings had been written in red ink, and these were copied in black, to conform to our present custom.

4. Cards were made for biographical material in certain periodicals, continuing the work of 1932.

5. The author indices for *Botanical Abstracts*, Vols. 12-15, partially made last year, were completed and are now available for reference in MS. form.

6. The scheme of classification for the lantern slides, worked out by the librarian with the cooperation of the staff, was adopted and applied, and the slides are now filed by subject. As this phase of the work belongs in another department, little was required from the library at this time except advice on the principles and application of subject headings and classification.

7. For a short time the library had the services of a binder from the Emergency Unemployment Relief Committee and a number of volumes were re-backed and mended. It was unfortunate that he was laid off after only a few weeks work. We could keep this man busy practically on full time, thereby reducing our bills for regular (*i.e.* outside) binding.

8. Having a trained worker gave us the opportunity of re-

classifying the section of monographs of Systematic Botany. A member of the scientific staff assisted in assigning family names, and the changing of numbers on cards and books of the entire group has been completed.

9. Assistance was given in the making of various bibliographies during the year. Material was assembled, from other libraries as well as our own, checked and summarized, for a paper by the Director on the effect of radium rays on plants (a resumé of . . . papers from 1901 to 1932), for a lecture on botanical literature, given by him before the New York Library Club; for an article on roses, rose culture, and rose gardens, which the horticulturist planned as a number of the Brooklyn Botanic Garden RECORD (not yet published), and for one on plant propagation, published in Brooklyn Botanic Garden *Leaflets*, Ser. 21, No. 2-6, April 26, 1933. A long list, prepared by the Metropolitan Museum of Art, on the literature of sources for botanical illustration, was checked and our holdings added, in connection with an exhibit at the Museum of plant forms in ornament.

10. Books, illustrations, seed catalogues, etc., were laid out for inspection on the special flower days observed by the Garden; and for a meeting of the executives of the Garden Club of America we exhibited a small group of books showing the development and history of botanical illustration.

REFERENCE WORK

During the year we answered over five hundred reference questions (*i.e.* questions which required checking and searching for material) by mail and personally from members of the Garden and others who wished information on many aspects of botanical and horticultural science. Students of all ages came to prepare assignments, teachers to obtain information and material for lectures, amateur gardeners for advice on the planting and care of flowers, the staff for lists of books, illustrations, identification of plants, and elusive citations. It should be noted that all projects, practical, educational, and scientific, planned by any department of the Botanic Garden, eventually require research work in the library, reviewing existing literature of the subject. Thus the library becomes increasingly useful with each new development.

NEEDS OF THE LIBRARY

As reported last year, another trained worker is needed, since the smooth functioning of the library depends to a very large extent on the prompt and accurate filing of material, adequate cataloging, and immediate attention to many small details that seem to take a disproportionate amount of time. Wherever possible, this work has been simplified and curtailed, but there is still more than can be properly accomplished by a staff of two persons.

It seems hardly necessary to repeat that funds are urgently needed for the purchase of new books and the binding of old ones. In checking over desiderata we find that items amounting to over \$6,000 have been listed during the last three years, from various catalogues, all necessary and most of which were requested by users of the library. Several long runs and sets of periodicals were completed in 1933, increasing the usefulness of these particular titles, but many more are still awaiting purchase. The subscription prices of all foreign periodicals have risen, as the dollar has dropped in value, and more of our small allowance must be used for these in order to keep our sets unbroken.

The constant use of our serials, both by readers in the library and by other institutions to which we lend them, is proof of their value.

INTERLIBRARY LOANS

During 1933, 80 volumes were loaned to: Brooklyn Museum Library; Buffalo Museum of Science; Carnegie Institution of Washington, Department of Genetics, Cold Spring Harbor, L. I.; Columbia University Library; Massachusetts Horticultural Society, Boston; Metropolitan Life Insurance Company, New York; New Jersey Agricultural Experiment Station, New Brunswick; New York Botanical Garden Library; New York Horticultural Society; Rockefeller Institute for Medical Research, New York. Loans were also made to individuals from the library of the American Fern Society (deposited here), in accordance with the arrangement with this Society.

We borrowed 60 volumes from: American Museum of Natural History; American Geographical Society, New York; Dr. George Beatty, Brooklyn; Brooklyn Public Library; Columbia University

Library; Library, New York State College of Agriculture, Ithaca, N. Y.; Massachusetts Horticultural Society, Boston; Massachusetts State College Library, Amherst; Medical Society of the County of Kings, Brooklyn; New York Botanical Garden Library; U. S. Department of Agriculture Library, Washington, D. C.

The statistical report follows.

Respectfully submitted,

EMILIE P. CRICHESTER,
Library Assistant in Charge.

STATISTICAL REPORT ON THE LIBRARY

ACCESSIONS

	Autograph Letters	Portraits	Volumes	Pamphlets	Parts (Including Periodicals)
Exchange	0	0	20	85	3,590
Gift	119	38	157	329	834
Publication	0	0	0	154	45
Purchase	1	2	278	45	889
By binding	0	0	0	0	0
Total	120	40	455	613	5,358

Total number of volumes in library, December 31, 1932 17,451
 Number of volumes added during 1933 455

Total number of volumes in library, December 31, 1933 17,906

Total number of pamphlets in library, December 31, 1932 13,487

Number of pamphlets added during 1933 613

Total number of pamphlets in library, December 31, 1933 14,100

Total number of volumes and pamphlets in library, December 31, 1932 30,938

Net increase of volumes and pamphlets during 1933 1,068

Total number of volumes and pamphlets in library, December 31, 1933 32,006

AMERICAN FERN SOCIETY COLLECTION

Number of volumes, December 31, 1932 36

Number of volumes added during 1933 3

Total number of volumes, December 31, 1933 39

Number of pamphlets, December 31, 1932	156
Number of pamphlets added during 1933	6
	<hr/>
Total number of pamphlets, December 31, 1933	162

SERIALS AND PERIODICALS

(Including only those of which numbers were received in 1933)

Subscription	128
Gift	88
Exchange	756
Publication	7
	<hr/>
Total	979

CATALOGING

Books, Pamphlets, and Serials cataloged	1,127
Total number of cards typewritten and filed	1,666

PRINTED CARDS

Torrey Botanical Club index cards on file, December 31, 1932	44,785
Filed during 1933	1,286

Total, December 31, 1933 46,071

Catalogue en fiches de la Bibliographie Technique et Agriculture Tropicale, Institut Colonial de Marseille, December 31, 1932	9,693
Number of cards received during 1933	380

Total, December 31, 1933 10,073

MISCELLANEOUS

Number of users of the library	3,494
Books lent to members of the staff	1,208
Books lent to other institutions	80
Books borrowed from other institutions	60

FINANCIAL STATEMENT FOR 1933

I. TAX BUDGET ACCOUNTS

1530 <i>Personal Service: (Regular Employees)</i>	
1531 " " <i>(Temporary Employees)</i>	
Appropriation	\$ 69,266.00
Expended	69,266.00

Other Codes than Personal Service:

Code 1532	Fuel Supplies:		
	Appropriation	\$	2,500.00
	Transferred from Department of Plant and Structures 2768	982.50 \$	3,482.50
	Expended		3,482.50
Code 1533	Office Supplies:		
	Appropriation	\$	400.00
	Expended		400.00
Code 1534	Laundry, Cleaning and Disinfecting Supplies:		
	Appropriation	\$	130.00
	Expended		130.00
Code 1535	Botanical and Agricultural Supplies:		
	Appropriation	\$	2,000.00
	Expended		2,000.00
Code 1536	Motor Vehicle Supplies:		
	Appropriation	\$	100.00
	Expended		100.00
Code 1537	General Plant Supplies:		
	Appropriation	\$	300.00
	Expended		300.00
Code 1538	Wearing Apparel:		
	Appropriation	\$	1.00
	Expended		1.00
Code 1539	Office Equipment:		
	Appropriation	\$	50.00
	Expended		50.00
Code 1540	General Plant Equipment:		
	Appropriation	\$	1,000.00
	Expended		1,000.00
Code 1541	General Plant Materials:		
	Appropriation	\$	1,000.00
	Expended		1,000.00

Code 1542	Repairs and Replacements:		
	Appropriation	\$ 2,580.00	
	Transferred from Department of Plant and Structures 2768	700.00	
	Transferred from Board of Child Welfare 2113, Fixed Charges and Contributions	259.94	\$ 3,539.94
	Expended		3,539.94
Code 1543	Light, Heat and Power:		
	Appropriation	\$ 500.00	
	Expended		500.00
Code 1544	Telephone Service:		
	Appropriation	\$ 500.00	
	Expended		500.00
Code 1545	Carfare:		
	Appropriation	\$ 60.00	
	Expended		60.00
Code 1546	Expressage and Deliveries:		
	Appropriation	\$ 200.00	
	Expended		200.00
Code 1547	General Plant Service:		
	Appropriation	\$ 400.00	
	Expended		400.00
Code 1548	Contingencies:		
	Appropriation	\$ 50.00	
	Expended		50.00
<i>Summary of Tax Budget Accounts:</i>			
	Appropriated		
	Personal Service	\$ 69,266.00	
	Other Codes		
	Original Appropriation	\$ 11,771.00	
	Supplemental (by transfers)	1,942.44	13,713.44
	Total		82,979.44
	Expended		<u>\$ 82,979.44</u>

II. PRIVATE FUNDS ACCOUNTS

1. *Endowment Fund* (\$50,500.00) *Restricted: **

Income Account:

Income 1933	\$	2,240.94
Transferred to Endowment Increment Fund \$	224.09	
Transferred to Special Contributions	2,016.85	2,240.94
	\$	0.00

2. *Life Membership Fund* (\$7,000.00) *Restricted:*

Income Account:

Income 1933	\$	293.44
Transferred to Endowment Increment Fund \$	29.34	
Transferred to Annual Membership Account	264.10	293.44
	\$	0.00

3. *George C. Brackett Library Fund* (\$500.00) *Restricted:*

Income Account:

Income 1933	\$	22.19
Expended	\$	21.17
Transferred to Endowment Increment Fund	1.02	22.19
	\$	0.00

4. *Benjamin Stuart Gager Memorial Fund* (\$13,417.20) *Restricted:*

Income Account:

Balance, January 1, 1933	\$	4.16
Income 1933	595.44	\$ 599.60
Expended	\$	366.12
Transferred to Endowment Increment Fund	59.53	425.65
Balance, December 31, 1933	\$	173.95

5. *Martha Woodward Stutser Memorial Fund* (\$10,000.00) *Restricted:*

Income Account:

Balance, January 1, 1933	\$	432.32
Income 1933	443.75	\$ 876.07
Expended	\$	712.02
Transferred to Endowment Increment Fund	44.38	756.40
Balance, December 31, 1933	\$	119.67

* Restricted funds are those limited by terms of gift, bequest, or solicitation, to the scientific and educational work of the Garden.

6. *Mary Bates Spalding Fund (\$2,697.00) Restricted:*

Income Account:

Balance, January 1, 1933	\$	119.70	
Income 1933	119.68	\$	239.38
Expended	\$	120.00	
Transferred to Endowment Increment Fund	11.96		131.96
Balance, December 31, 1933	\$		107.42

7. *Alfred T. White Fund (\$243,149.27) Restricted:*

Income Account:

Income 1933	\$	10,789.73	
Transferred to Endowment Increment Fund	\$	1,078.97	
Transferred to Special Contributions	7,110.76		
Transferred to Tuition & Sales, Elem. Instr.	200.00		8,389.73
Balance, December 31, 1933	\$		2,400.00

8. *A. Augustus Healy Bequest (\$9,798.31) Restricted:*

Income Account:

Income 1933	\$	434.78	
Transferred to Endowment Increment Fund	\$	43.48	
Transferred to Special Contributions	391.30		434.78
			\$ 0.00

9. *Robert B. Woodward Bequest (\$25,000.00) Restricted:*

Income Account:

Income 1933	\$	1,109.37	
Transferred to Endowment Increment Fund	\$	110.94	
Transferred to Special Contributions	998.43		1,109.37
			\$ 0.00

10. *Alfred T. White Memorial Tablet Fund (\$3,889.85) Restricted:*

Income Account:

Income 1933	\$	172.60	
Transferred to Endowment Increment Fund	\$	17.26	
Transferred to Special Contributions	155.34		172.60
			\$ 0.00

11. *Brooklyn Institute Centennial Fund B. B. G. Share (\$30,000.00) Restricted:*

Income Account:

Income 1933	\$	1,331.25	
Transferred to Endowment Increment Fund	\$	133.12	
Transferred to Special Contributions	1,198.13		1,331.25
			\$ 0.00

12. *John D. Rockefeller, Jr., Fund (\$250,000.00) Restricted:*

Income Account:

Balance, January 1, 1933	\$	2,207.55	
Income 1933		10,572.92	\$ 12,780.47

Expended	\$	641.22	
Transferred to Endowment Increment Fund		1,057.29	
Transferred to Special Contributions		9,150.59	10,849.10

Balance, December 31, 1933	\$	1,931.37	
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13. *Citizens Endowment Fund (\$253,929.26) Restricted:*

Income Account:

Income 1933	\$	10,739.08	
Transferred to Endowment Increment Fund	\$	1,073.91	
Transferred to Special Contributions		9,665.17	10,739.08

	\$	0.00	
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14. *Sustaining Membership. Restricted:*

Balance, January 1, 1933	\$	66.64	
Received from dues		416.50	\$ 483.14

Transferred to Annual Membership Account		458.15	
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Balance, December 31, 1933	\$	24.99	
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15. *Annual Membership. Restricted:*

Balance, January 1, 1933	\$	501.30	
Received from dues 1933		5,350.00	
Transferred from Life Membership Account		264.10	
Transferred from Sustaining Membership ..		458.15	
Miscellaneous Receipts		38.65	\$ 6,612.20

Expended	\$	4,901.89	
Transferred to Special Contributions		1,500.00	6,401.89

Balance, December 31, 1933	\$	210.31	
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16. *Tuition and Sales. Restricted:*

Balance, January 1, 1933	\$	3,256.76	
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Received 1933

a. Tuitions		1,551.15	
b. Seed Packets		6,364.98	
c. Sales		324.67	
d. Miscellaneous		8.51	

Transferred from J. D. Rockefeller, Jr.,			
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Fd.		200.00	\$ 11,706.07
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Expended	\$	3,956.91	
Transferred to Special Contributions		5,900.00	
Transferred to Mrs. H. C. Folger Fund07	9,856.98
Balance, December 31, 1933	\$		1,849.09
17. <i>Botanic Garden Collections Fund. Restricted:</i>			
Balance, January 1, 1933	\$	1,267.70	
Received from Contributions		6,134.00	
Miscellaneous		17.36	
Transferred from Spec. Purposes—George Washington Memorial Tree		15.00	\$ 7,434.06
Expended	\$	3,145.05	
Transferred to Special Contributions		4,000.00	7,145.05
Balance, December 31, 1933	\$		289.01
18. <i>Cary Library Fund \$10,000.00—1/5 of Income to Brooklyn Botanic Garden) Restricted:</i>			
Balance, January 1, 1933	\$	28.19	
Income Allotment 1933		88.75	\$ 116.94
Expended	\$	44.36	
Transferred to Endowment Increment Fund		8.88	53.24
Balance, December 31, 1933	\$		63.70
19. <i>Henry W. Healy Trust Fund (\$231,977.17—1/4 of Income to Brooklyn Botanic Garden) Restricted:</i>			
Balance, January 1, 1933	\$	0.00	
Income 1933		1,717.05	\$ 1,717.05
Transferred to Endowment Increment Fund	\$	171.71	
Transferred to Special Contributions		1,545.34	1,717.05
			\$ 0.00
20. <i>Mrs. Henry C. Folger Fund (\$1,000.00) Restricted:</i>			
Income Account:			
Balance, January 1, 1933	\$	19.56	
Income 1933		44.37	
Transferred from Tuition & Sales, Elem. Instr.07	\$ 64.00
Expended			64.00
	\$		0.00

21. *Special Purposes. Restricted by Terms of Gifts:*

Balance, January 1, 1933	\$	821.83	
Received:			
<i>a.</i> Anonymous for Japanese Garden		500.00	
<i>b.</i> Special Gifts for Children's Work		92.00	
<i>c.</i> Bronze Tablets for Glacial Boulders ...		61.67	
<i>d.</i> Victory Maples		150.00	
<i>e.</i> Alfred W. Jenkins Bequest		5,000.00	
<i>f.</i> Planting the Laboratory Plaza		1,502.00	
<i>g.</i> Emergency Fund		65.00	
<i>h.</i> Miscellaneous		534.00	\$ 8,726.50
Expended	\$	5,620.96	
Transferred to Collections Fund		15.00	
Transferred to Special Contributions		2,049.60	7,685.56
Balance, December 31, 1933	\$		1,040.94

22. *Plant Pathology Research Fund. Restricted:*

Balance, January 1, 1933	\$	3.28	
Income 1933		6,000.00	\$ 6,003.28
Expended	\$	28.30	
Transferred to Special Contributions		5,500.00	5,528.30
Balance, December 31, 1933	\$		474.98

23. *Special Contributions (for 1933 only) Restricted:*

Balance, January 1, 1933	\$	2,149.40	
Contributed by Staff to Emergency Unemployment Relief Fund		19.18	
Salary Rebate		200.00	
Miscellaneous		120.00	
Transferred from			
Endowment Fund Income Account		2,016.85	
Alfred T. White Fund Income Account ..		7,110.76	
A. Augustus Healy Bequest Income Account		391.30	
R. B. Woodward Bequest Income Account		998.43	
A. T. White Memorial Tablet Fund Income Account		155.34	
Brooklyn Inst. Centennial Fund Income Account		1,198.13	
J. D. Rockefeller, Jr., Fund Income Account		9,150.59	
Citizens Endowment Fund Income Account		9,665.17	
Annual Membership Account		1,500.00	
Tuition & Sales, Elem. Instr.		5,900.00	

Collections Fund	4,000.00	
Henry W. Healy Trust Fund	1,545.34	
Plant Pathology Research Fund	5,500.00	
Special Purposes		
Planting Laboratory Plaza ... \$ 1,484.60		
Emergency Fund	65.00	
Miscellaneous	500.00	2,049.60
		<hr/>
Received from Woman's Auxiliary	733.50	\$ 54,403.59
		<hr/>
Expended		52,855.03
		<hr/>
Balance, December 31, 1933		\$ 1,548.56
24. <i>Endowment Increment Fund (\$124,989.26) Restricted:</i>		
Transferred from Other Accounts 1933	\$ 4,065.88	
Interest 1933	5,166.62	
E. Addie Austin Bequest	1,000.00	\$ 10,232.50
		<hr/>
Transferred to Principal		10,232.50
		<hr/>
		\$ 0.00
<i>Summary of Private Funds Accounts:</i>		
Balances, January 1, 1933	\$ 10,878.39	
Income 1933	82,065.13	\$ 92,943.52
		<hr/>
Expended	\$ 72,477.03	
Transferred to Endowment Increment Fund		
Principal	10,232.50	82,709.53
		<hr/>
Balances, December 31, 1933		\$ 10,233.99
III. SUMMARY OF TOTAL MAINTENANCE BUDGET FOR 1933		
<i>Income</i>		
Tax Budget Appropriation, 47.2%	\$ 82,979.44	
Private Funds Budget, 52.8%	92,943.52	
		<hr/>
Total		\$175,922.96
Transferred to Endowment Increment Fund Principal ..		10,232.50
		<hr/>
Available		\$165,690.46
<i>Expended</i>		
Personal Service		
Tax Budget	\$69,266.00	
Private Funds	52,855.03	
		<hr/>
Total		\$122,121.03

Other than Personal Service

Tax Budget \$13,713.44

Private Funds 19,622.00

Total 33,335.44 \$155,456.47

Balance, December 31, 1933 \$ 10,233.99

Respectfully submitted,

DANIEL C. DOWNS,

Secretary and Accountant.

Note: The above "Financial Statement" is a transcript of Brooklyn Botanic Garden accounts in the books of the Treasurer of the Brooklyn Institute of Arts & Sciences. The Treasurer's accounts are audited annually by a Public Accountant, and a separate audit of this "Financial Statement" is not made in order to save unnecessary expense.

EDWIN P. MAYNARD,

Treasurer.

IV. TAX NOTES FOR PERMANENT IMPROVEMENTS

N.D.P. 212Q—Completion of improvement of Plaza of Brooklyn Botanic Garden, including construction of underground storage room for tools and bulbs. (Including Architects' Fees.)

Appropriation \$ 21,000.00

Expended

	1930	1931	1932	1933
Architects' Fees	\$ 1,160.79	\$ 304.33	\$ 0.00	\$0.00
Improvement Work ..	15,477.20	3,400.00	655.00	0.00

Totals	\$16,637.99	\$3,704.33	\$655.00	\$0.00	20,997.32
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Balance, December 31, 1933 \$ 2.68

N.D.P. 212T—General Improvement of Land, lying east of Mt. Prospect Reservoir fronting on Eastern Parkway, including Architects' Fees.

Appropriation \$ 24,100.00

	1932	1933
Expended	\$ 551.97	\$0.00

Rescinded April 1, 1932 22,368.65 0.00 22,920.62

Balance	\$ 1,179.38
Contract Reserve	1,172.60

Balance, December 31, 1933 \$ 6.78

Certified as correct.

EDWARD S. RYAN, *Chief Clerk,*
Department of Parks, Borough of Brooklyn.

APPENDIX 1

GIFTS RECEIVED DURING 1933

Collections Fund

Anonymous	Miss Hilda Loines
Frank L. Babbott	Mrs. William W. Marshall
Mrs. Frank L. Babbott, Jr.	Mrs. Edwin P. Maynard
Frank Bailey	James H. Post
Edward C. Blum	Mrs. James H. Post
Mrs. Edward C. Blum	Mrs. Frederic B. Pratt
Brooklyn Woman's Club	Harold I. Pratt
Mrs. Armin E. Brunn	Mrs. William A. Putnam
Mrs. Glentworth R. Butler	Miss Elise W. Stutzer
Mrs. S. Parkes Cadman	Nathan Sweedler
Walter H. Crittenden	Mrs. Mary Van Norden
Mrs. Mary Childs Draper	A. C. Veatch
Dugan Brothers	"C. W."
Miss Adele F. Emerson	Mrs. R. C. Weithas
John W. Frothingham	Miss Frances E. White
Anthony Gilas	Miss Harriet H. White
William T. Hunter	Peter Piper Wright (A dog)
Miss C. Julie M. Husson	Miss Abigail Young

Japanese Garden

Anonymous \$ 500.00

Special Gifts for Children's Work

Anonymous	\$ 25.00
Mrs. Charles E. Perkins	25.00
Maxwell Teachers Training School	20.00
N. Y. P. S. Kindergarten Association, Brooklyn Section	10.00
Parent Teachers of P. S. No. 117	10.00
Miss Florence King	2.00

Bronze Tablet for Boulder Hill

Boys and Girls Club, B. B. G.	\$ 61.67
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Victory Maples

Colonial Daughters of the 17th Century	\$ 50.00
Mrs. Walter V. Cranford	50.00
Fort Greene Chapter D. A. R.	50.00

Alfred W. Jenkins

Bequest	\$5,000.00
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Planting the Laboratory Plaza

Woman's Auxiliary, B. B. G. (58 Contributors)	\$1,502.00
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Emergency Fund

For Labor (5 Contributions)	\$ 65.00
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Miscellaneous

Anonymous (For labor)	\$ 500.00
Women of '76 Chapter N. S. D. A. R. (Tree)	15.00
Miss Hilda Loines (Book)	10.00
Mrs. Frederick W. Rowe (Bronze Tablet)	6.00
Woman's Auxiliary of the B. B. G. (Service)	3.00

Library

Books

Anonymous	2
Antibes. Ministère de l'Agriculture. Institut des recherches agronomiques. Villa Thuret, Antibes, France	1
Becker, Mr. Herman, Brooklyn, N. Y.	1
Black, Hon. Loring M., Washington, D. C.	1
Blatt, Miss Natalie, Brooklyn, N. Y.	1
Blum, Mr. Edward C., Brooklyn, N. Y.	1
Brewster, Miss Laura M., Brooklyn, N. Y.	1
Brooklyn Botanic Garden Boys' and Girls' Club	1
Brooklyn Botanic Garden Woman's Auxiliary	2
Brooklyn College	1
Brunswick, Master Sanford, Cedarhurst, L. I.	1
Burgess, Mrs. Edward S. and Miss Burgess, Yonkers, N. Y.	1
Butler, Mrs. Glentworth R., Brooklyn, N. Y.	1
Carnegie Institution of Washington, Washington, D. C.	8
Cary, Mrs. William H., New Canaan, Conn.	1

Chichester, Mrs. Emilie P., Brooklyn, N. Y.	1
Delafield, Mrs. John R., New York, N. Y.	3
Dijon. Faculté des Sciences, Laboratoire de Botanique, Dijon, France	2
Dorward, Miss Margaret M., Brooklyn, N. Y.	1
Dr. Drushel's Class in Teaching of Elementary Science, New York University, 1933	2
Fairbanks, Miss M. B., Brooklyn, N. Y.	1
Free, Mr. Montague, Brooklyn, N. Y.	1
Gager, Dr. C. Stuart, Brooklyn, N. Y.	14
Gager, Miss Prudence, Brooklyn, N. Y.	1
General Lord Stirling Society, Children of the American Revolution, Brooklyn, N. Y.	3
Gluckson, Master Herbert, Brooklyn, N. Y.	1
Gluckson, Master Simeon, Brooklyn, N. Y.	1
Graves, Dr. Arthur Harmount, Brooklyn, N. Y.	1
Graves, Dr. Arthur Harmount and Miss Hester M. Rusk, Brooklyn, N. Y.	2
Estate of Dr. Arthur Hollick, New York, N. Y.	56
Husson, Miss C. Julie M., Brooklyn, N. Y.	3
Ikeno, Professor S., Tokyo, Japan	1
Johnson, Mr. Edward, Brooklyn, N. Y.	1
Kindergarten Mothers, P. S. 225, Brooklyn, N. Y.	1
Loines, Miss Hilda, Brooklyn, N. Y.	4
Meguro, Tokyo. Imperial Forestry Experimental Station	1
Morrison, Mr. B. Y., Washington, D. C.	1
Mothers' Club of P. S. 47, Brooklyn, N. Y.	1
National Federation of Coffee Growers of Colombia, New York, N. Y.	1
Nebraska State Horticultural Society, Lincoln, Neb.	1
Oppenheim, Mrs. William W., East Orange, N. J.	1
Parents' Association, P. S. 217, Brooklyn, N. Y.	1
Reed, Miss Mae, Brooklyn, N. Y.	1
Roosevelt Garden Club, Maxwell Teachers Training College, Brooklyn	10
Salisbury, Dr. E. J., London, Eng.	1
Shaw, Miss Ellen Eddy, Brooklyn, N. Y.	1
Smalley, Master Melvin, Brooklyn, N. Y.	2
Späth, Mr. L., Berlin, Germany	1
Stoll, Mr. Frank, Brooklyn, N. Y.	1
Taffae, Master David, Cedarhurst, L. I.	1
Taffae, Miss Rosalind, Cedarhurst, L. I.	1
U. S. Department of Agriculture, Forest Service, Washington, D. C...	2
Voris, Miss Maude E., Brooklyn, N. Y.	1
Weaver, Miss Josephine M., Brooklyn, N. Y.	1
White, Mr. Alain, Litchfield, Conn.	1
Zimmele, Mr. Charles F., Brooklyn, N. Y.	1
Total	156

PAMPHLETS

American Museum of Natural History Library, New York, N. Y.	14
Antibes. Ministère de l'Agriculture. Institut des recherches agronomiques. Villa Thuret, Antibes, France	1
Bach, Mr. Richard F., New York, N. Y.	1
Bartlett, Professor H. H., Ann Arbor, Mich.	1
Bartlett Tree Research Laboratories, Stamford, Conn.	1
Brooks, Dr. Matilda Moldenhauer, Berkeley, Calif.	12
Bryant, Mrs. E. A., Rancho Santa Ana, Los Angeles, Calif.	1
Butler, Mrs. Glentworth R., Brooklyn, N. Y.	1
Carnegie Institution of Washington, Dept. of Genetics, Cold Spring Harbor, L. I.	23
Cheney, Dr. Ralph H., Brooklyn, N. Y.	2
Coker, Dr. William C., Chapel Hill, N. C.	1
Connecticut Agricultural Experiment Station, New Haven, Conn.	1
Cornell University, Dept. of Plant Pathology, Ithaca, N. Y.	12
Dijon. Faculté des Sciences, Laboratoire de Botanique, Dijon, France	10
Firestone Tire & Rubber Company, Akron, O.	1
Free, Mr. Montague, Brooklyn, N. Y.	2
Gager, Dr. C. Stuart, Brooklyn, N. Y.	139
Gager, Mrs. C. Stuart, Brooklyn, N. Y.	1
Geologiska Foreningens, Stockholm, Sweden	3
Graves, Dr. Arthur Harmount, Brooklyn, N. Y.	23
Gundersen, Dr. Alfred, Brooklyn, N. Y.	6
Institute of International Education, New York, N. Y.	1
Kansas State Board of Agriculture, Manhattan, Kan.	1
Kurz, Dr. Herman, Tallahassee, Fla.	1
Lloyd, Professor Francis E., Montreal, P. Q.	1
Loines, Miss Hilda, Brooklyn, N. Y.	4
Lutz, Dr. Frank E., New York, N. Y.	5
Mexia, Mrs. Ynes, Berkeley, Calif.	1
Morse, Miss E. E., Berkeley, Calif.	1
Morton, Mr. C. V., Washington, D. C.	1
Mulford, Miss Fanny A., Garden City, L. I.	2
Nábělek, Dr. V., Bratislava, Czechoslovakia	2
National Federation of Coffee Growers of Colombia, New York, N. Y.	1
New York Public Library	7
New York State Conservation Department, State Council of Parks, Albany, N. Y.	1
Overbeek, Mr. J. van, Schiedam, Netherlands	1
Papadakis, Dr. J., Salonica Plant Breeding Station, Greece	1
Philippines, University of the. Plant Pathology Library, Laguna, P. I.	1
Plotnikowa, Dr. T. W., Kiew, U. S. S. R.	1
Porsild, Dr. Morten P., Disko, Greenland	1
Reed, Dr. George M., Brooklyn, N. Y.	5

Rothamsted Experimental Station, Harpenden, Herts, Eng.	6
St. John, Dr. Harold, Honolulu, Hawaii	3
Saunders, Miss Edith R., Cambridge, Eng.	1
Schmidt, Mr. G., Leonia, N. J.	1
Sears, Dr. Paul B., Norman, Okla.	1
South Carolina Food Research Commission, Charleston, S. C.	1
Spaulding, Dr. Perley, New Haven, Conn.	1
Spingarn, Mr. J. E., Amenia, N. Y.	1
Station Centrale de Pathologie Végétale, Versailles, France	4
Svenson, Dr. Henry K., Brooklyn, N. Y.	11
Szymkiewicz, Dr. Dezydery, Lwow, Poland	1
Weston, Dr. William H., Jr., Cambridge, Mass.	1
Total	327

PARTS OF PUBLICATIONS

(Exclusive of Government Documents)

Agassiz Association, Inc., Old Greenwich, Conn.	1
American Horticultural Society, Washington, D. C.	4
American Museum of Natural History, Dept. of Public Education, New York, N. Y.	1
Ames, Professor Oakes, Cambridge, Mass.	6
Bailey, Professor L. H., Ithaca, N. Y.	2
Bausch & Lomb Optical Company, Rochester, N. Y.	1
British Guiana. Department of Agriculture, Georgetown	1
Brooklyn Museum Library	4
Cambridge University, Cambridge, Eng.	2
Canada. Dept. of the Interior, Forest Products Laboratories, Ottawa, Ont.	4
Canada. Dept. of Mines, Geological Survey, Ottawa, Ont.	1
Carnegie Institution of Washington, Washington, D. C.	1
Carnegie Institution of Washington, Dept. of Genetics, Cold Spring Harbor, L. I.	1
Cheesman, Professor E. E., Trinidad, B. W. I.	1
Cox, Rev. George, Mornington, Victoria, Australia	3
Cromwell Publishing Company, Springfield, O.	1
Florida Entomological Society, Gainesville, Fla.	3
Flushing Garden Club, Flushing, L. I.	1
Free, Mr. Montague, Brooklyn, N. Y.	13
Gager, Dr. C. Stuart, Brooklyn, N. Y.	44
Graves, Dr. Arthur Harmount, Brooklyn, N. Y.	40
Hawaiian Academy of Sciences, Honolulu, Hawaii	2
Hawaiian Forester and Agriculturist, Honolulu, Hawaii	2
Estate of Dr. Arthur Hollick, New York, N. Y.	5
Imperial Bureau of Plant Genetics, Aberystwyth, Wales	2

Imperial College of Tropical Agriculture, Trinidad, B. W. I.	1
Jenkins, Mr. Charles F., Germantown, Pa.	4
Jenkins, Miss Dorothy, Brooklyn, N. Y.	1
Kenya Colony and Protectorate. Forest Department, Nairobi	1
Liège, Belgium. Institut de Botanique de l'Université de Liège	1
McFarland Organizations, Harrisburg, Pa.	2
Mathewson, Mr. Chester A., Flushing, N. Y.	2
Medical Society of the County of Kings, Brooklyn, N. Y.	14
Meguro Forestry Experimental Station, Meguro, Tokyo, Japan	1
Merrill, Mrs. Whitney, Brooklyn, N. Y.	1
Metropolitan Museum of Art, New York, N. Y.	6
Mulford, Miss Fanny A., Garden City, L. I.	7
National Plant, Flower and Fruit Guild, New York, N. Y.	3
National Research Council, Washington, D. C.	1
National Research Council of Japan, Tokyo, Japan	1
National Shade Tree Conference, Rochester, N. Y.	1
New York Public Library	3
New York State Museum, Albany, N. Y.	1
Ohara Institute for Agricultural Research, Kurashiki, Japan	3
Phytogeographical Society, Kyoto, Japan	1
Porto Rico, Insular Experiment Station, Rio Piedras	2
Reed, Dr. George M., Brooklyn, N. Y.	48
Roosevelt Wild Life Forest Experiment Station, Syracuse, N. Y.	1
Rothamsted Experimental Station, Harpenden, Herts, Eng.	1
School Garden Association, New York, N. Y.	5
Shaw, Miss Ellen Eddy, Brooklyn, N. Y.	5
Sociedad Española de Historia Natural, Madrid, Spain	6
Southern Methodist University, Dallas, Texas	2
Struckmann, Mr. Erick, Copenhagen, Denmark	1
Svenson, Dr. Henry K., Brooklyn, N. Y.	2
Taihoku Imperial University, Formosa, Japan	1
Tashkent, Russia. Hortus Botanicus	1
Tohoku Imperial University, Sendai, Japan	3
Towson Nurseries, Towson, Md.	6
U. S. Department of Agriculture Library, Washington, D. C.	1
U. S. Department of the Interior, National Park Service, Berkeley, Calif.	1
Wild Flower Preservation Society, Washington, D. C.	5
Worcester Natural History Society, Worcester, Mass.	2
Yale University, School of Forestry, New Haven, Conn.	4

PORTRAITS AND PHOTOGRAPHS

Bausch & Lomb Optical Company, Rochester, N. Y.	1
Gager, Dr. C. Stuart, Brooklyn, N. Y.	9
Harrison, Dr. Carrie, Washington, D. C.	13
Kimball, Mr. Fiske, Philadelphia, Pa.	1
Lewis, Mrs. R. B., Germantown, Pa.	8
Washington Evening Star, Washington, D. C.	1
Weston, Dr. William H., Jr., Cambridge, Mass.	4
Total	37

AUTOGRAPH LETTERS

Gager, Dr. C. Stuart, Brooklyn, N. Y.	119
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MISCELLANEOUS

- Averill, Miss Mary, New York, N. Y. 8 Post Cards.
 LaRue, Miss Lena, New York, N. Y. 3 Designs based on plant forms.
 Gager, Dr. C. Stuart, Brooklyn, N. Y. Mss. of paper, Effect of radium rays on plants: resumé of . . . papers from 1901 to 1932.
 U. S. Dept. of the Interior, Washington. 1 Map.

Living Plants

- Dr. A. A. Barnhardt, Brooklyn, 18 Desert cacti and 2 Mesembryanthemums.
 Bobbink & Atkins, Rutherford, N. J., 78 rose plants in 39 varieties,
 1 *Ligustrum coriaccum*.
 Mrs. Otilia A. Brockway, Brooklyn, 1 plant of *Epimedium*.
 Miss A. C. Clark, Brooklyn, 1 *Agave americana*.
 Conard-Pyle Co., West Grove, Pa., 10 rose plants in 7 varieties.
 Miss Margaret Cranford, Conn., 1 *Cleome serrulata*, 15 bulbs of *Erythronium Hendersoni*, and 4 native plants.
 Mr. Harold Dinzey, Brooklyn, 20 tubers of *Sagittaria chinensis*.
 Mrs. David Donalds, Elmhurst, L. I., 1 *Datura suaveolens*.
 H. A. Dreer, Philadelphia, 5 plants of roses in 3 varieties.
 Mr. Max Elwert, Red Hook, N. Y., 1 *Daphne Mezereum*, 6 *Asplenium*.
 Gardens of the Blue Ridge, Ashford, N. C., 1 *Tsuga caroliniana*.
 Greenwich Horticultural Co., New York City, 1 *Euphorbia Obesiae* and
 1 *Aloe variegata*.
 J. J. Grullemans & Sons, Lisse, Holland, 600 bulbs of Ideal Darwin Tulips
 in 30 varieties.
 Miss Sadie Hecht, New York City, 1 *Agave falcata*.
 Mrs. John Norman Henry, Pa., 1 *Opuntia fragilis*.
 Miss Julia Holloman, Brooklyn, 2 Peanut plants, 1 *Mamillaria*.
 Mrs. Henry T. Hotchkiss, Brooklyn, 6 *Calopogon pulchellus*.
 Mrs. Nathan S. Jonas, L. I., 407 orchids, 96 greenhouse and hardy plants.

- Mr. William Keller, Brooklyn, 1 *Crinum Rattrayii*.
 Miss Katherine C. King, Brooklyn, 1 *Jasminum officinale*.
 Mrs. Arthur Knapp, L. I., 1 *Hydrangea macrophylla cyanea*.
 Kovac's Nursery, Purchase, N. Y., 5 rose plants in 5 varieties.
 Mr. P. H. Langdon, Brooklyn, 1 hard shelled almond.
 Mrs. Julia A. Latimer, Mamaroneck, 1 *Helleborus niger*.
 Mr. Robert Lemmon, New York City, 3 *Epigaea repens*.
 Miss McCammon, Brooklyn, 2 *Gentiana crinita*.
 Joseph Manda Co., West Orange, N. J., 13 hybrid Cymbidiums.
 Mrs. Whitney Merrill, Brooklyn, 1 *Helleborus niger*.
 New Brunswick Nurseries, New Brunswick, N. J., 14 roses in 7 varieties.
 Mrs. George Penton, Brooklyn, 2 *Lagerstroemia indica*.
 Mrs. Spencer Phenix, Brooklyn, 11 native plants.
 Pinehurst Nursery, Summerville, S. C., 50 Wisteria scions.
 Poughkeepsie Nursery Co., Poughkeepsie, N. Y., 6 *Lonicera japonica aureo reticulata*.
 Mr. Fred C. Rodman, Brooklyn, 12 bulbs of *Colchicum*.
 Mr. A. Schlevogt, Kingsboro Nursery, 1713 East 16th St., Brooklyn, 1 *Salix gracilistyla*.
 Mrs. C. Sellick, Brooklyn, 1 avocado and 1 cactus.
 Mrs. Awbrey N. Shaw, Vt., 1 plant of *Asalea*.
 Miss Elise Stutzer, Brooklyn, 1 bulb of *Boussingaultia baselloides*.
 Mr. C. J. Svenson, Malden, Mass., 15 *Aronia atropurpurea*.
 Mr. William Tricker, Saddle River, N. J., 39 plants in 36 varieties of water lilies.
 U. S. Dept. of Agriculture, Bureau of Plant Quarantine, 9 plants and 14 cuttings of succulents.
 Miss Elsie Volmer, Brooklyn, 8 *Calla palustris*.
 Miss Elizabeth C. White, Whitesbog, N. J., 3 *Clethra alnifolia* (pink form), 6 *Pyxidanthera barbulata*.
 Mrs. T. B. Wood, Brooklyn, N. Y., 3 *Chelone glabra*, 1 *Epigaea repens*, 2 *Marrubium vulgare*.
 Miss Katherine V. Young, Bedford Hills, N. Y., 3 cuttings of *Viburnum alnifolium*.

Seeds

- | | |
|--------------------------------|-----------------------------|
| Mrs. Ervanna Bowen Bissell (1) | Mr. Leslie E. Mageau (2) |
| Mr. J. Cincotta (1) | Mr. Lewis A. Martin (1) |
| Miss Margaret Cranford (4) | Mr. George J. Peirce (2) |
| Miss Sadie Hecht (1) | Mr. O. M. Pudor (1) |
| Mrs. Henry T. Hotchkiss (1) | Dr. Attilio Ragionieri (1) |
| Dr. Homer D. House (3) | Mrs. J. E. Spingarn (1) |
| Mrs. A. E. Hyde (6) | Mr. J. E. Spingarn (3) |
| Mrs. Stephen Loines (1) | Mr. J. William Thompson (1) |
| Miss Margaret McKenny (6) | |

Note: Gifts of *Iris* are acknowledged in the Report of the Curator of Plants, page 75.

Phanerogamic Herbarium

Dr. J. A. Drushel, 76 specimens
 Mr. Max Elwert, 1 specimen.
 Mrs. Mary Holtzoff, 105 specimens.
 Mr. B. A. Krukoff, 54 specimens.
 Mrs. Stephen Loines, 1 specimen.
 Miss Fanny A. Mulford, 232 specimens.
 Dr. Henry K. Svenson, 88 specimens.
 Mr. M. Tatewaki, 2 specimens.

Cryptogamic Herbarium

No accessions in 1934

For the Department of Elementary Instruction

Anonymous, \$25.00 to be used as honorarium for lecture.
 Blum, Mr. Edward C., Five books for the children's clubroom library.
 Brewster, Miss Laura M., One book for the children's garden house.
 Brooklyn Plant, Flower and Fruit Guild, Two shrubs for the children's garden house.
 Brooklyn Section, New York Public School Kindergarten Association, \$10.00 for the work of the Department.
 Brunswick, Master Sanford, \$1.00 for the children's clubroom library.
 Butler, Mrs. Glentworth R., One prize cup competed for by the girls in the outdoor garden. One book for the children's clubroom library. \$5.00 for picture of children's Shakespeare Garden to be sent to Stratford-on-Avon. One guest book for the children's clubroom.
 Degen, Mr. John, \$5.00 for the children's clubroom library.
 Delafield, Mrs. John R., \$10.00 for the children's work.
 Dorward, Miss Margaret M., One book for the children's clubroom library.
 Gager, Dr. C. Stuart, One book for the children's clubroom library.
 Gager, Miss Prudence, One book for the children's clubroom library.
 Gluckson, Master Herbert, One book for the children's clubroom library.
 Gluckson, Master Simeon, One book for the children's clubroom library.
 Goodman, Mr. and Mrs. Joseph, One cup competed for by the boys in the outdoor garden.
 Graves, Dr. Arthur H., One book for the children's clubroom library.
 Henderson, Peter & Company, One mount of labels.
 Jones, Miss Ruth, One dry, unmounted cotton plant.
 King, Miss Florence, \$2.00 for the children's work.
 Loines, Miss Hilda, Four pamphlets on wild flowers for the children's clubroom library. Twenty picture postcards of plant subjects for use in children's classes.
 Maley, Miss Carleen, One book for the children's clubroom library.
 Maxwell Teachers' Training College, \$20.00 for books for the children's garden house.

- National Federation of Coffee Growers of Colombia, Fifty booklets, "The Land of Coffee" for use in children's classes.
- New York University, Class in the Teaching of Elementary Science. Two books for the children's clubroom library.
- Perkins, Mrs. Charles E., \$25.00 for prizes for children's garden work in the summer of 1933.
- Public School 66, Woodwork Class, Nineteen implements for use in children's garden house.
- Public School 117 Queens, Parent-Teachers Association, \$10.00 for the children's work.
- Public School 225 Mothers' Club, One book for the children's garden house.
- Shaw, Miss Ellen Eddy, Five hundred reprints of article published in "School Life" January, 1933. One book for the children's garden house. Two gold honor pins for honorable service in the outdoor garden. One prize book for children's garden work. One pewter cup as award for children's work.
- Singer Sewing Machine Company, Twelve sets of bird pictures for use in children's classes.
- Smalley, Master Melvin, Two books for the children's clubroom library.
- Taffae, Miss Rosalind, \$1.00 for children's clubroom library.
- Venezia, Master Louis, Two bags of tobacco dust for fertilizer.
- Voris, Miss Maude E., One book for the children's garden house.

Miscellaneous

- Bausch & Lomb Optical Co., Rochester, N. Y., 6 historical pictures showing development of microscope.
- Mr. F. E. Kenny (Mt. Vernon Argus), Mt. Vernon, N. Y., 1 photograph of large glacial boulder on Split Rock Road connecting the Boston Post Road and Southern Boulevard, near the Mt. Vernon boundary line.
- Mrs. Whitney Merrill, Brooklyn, 1 Wardian case.
- Metropolitan Museum of Art, New York City, 12 photographs 8" x 10".
- North Carolina, University of, 1 photograph of corn capitals.
- Mrs. W. Sterling Peters, Brooklyn, 1 brass flower container.
- Mrs. Spencer Phenix, Brooklyn, 1 photograph of Crocus in Brooklyn Botanic Garden lawn.
- Mrs. Alfred Piza, Atlantic Beach, L. I., 1 vial of Eucalyptus medicine.
- Miss Maud H. Purdy, Brooklyn, 65 flower pots.
- Mr. V. L. Van Horne, Brooklyn, 30 photographs of scenes in Brooklyn Botanic Garden.
- Mr. Louis Venezia, Brooklyn, 1 bushel of tobacco dust for fertilizer.
- Miss Josephine Weaver, Brooklyn, 1 negative of Washington Elm at Cambridge, Mass.

APPENDIX 2

PUBLICATIONS BY THE BOTANIC GARDEN
PERSONNEL DURING 1933**Becker, H.**

20. Internationale Blumenschau in New York. *Gärtnerei Fachblatt* 19: 6. June.
Frühling in New York. *Gärtnerei Fachblatt* 19: 199. July.

Benedict, Ralph C.

- Review: Oishi, Jisaburo. On the fossil Dipteridaceae. *Acta Phytotaxonomica et Geobotanica. Amer. Fern Jour.* 23: 25. January–March.
Review: Tagawa, M. Spicilegium Pteridographiae Asiae Orientalis, I and II. *Acta Phytotaxonomica et Geobotanica. Amer. Fern Jour.* 23: 25. January–March.
Review: Tatewaki, M. and U. Kimoto. Florula of the island of Kaibato (Todomoshiri). *Acta Phytotaxonomica et Geobotanica. Amer. Fern Jour.* 23: 25. January–March.
Review: Andersson-Kotto, Irma. Observations on the inheritance of apospory and alternation of generations. *Svensk Botanisk Tidskrift.* 1932. Bd. 26, H. 1–2. *Amer. Fern Jour.* 23: 26. January–March.
The cultural value of biology in secondary education. *New York State Education* 20: 530. April.
Report of the Resident Investigator (Ferns) for 1932. *Brooklyn Bot. Gard. Record* 22: 108–109. April.
The Hart's Tongue in three continents. *Amer. Fern Jour.* 23: 63. April–June.
What is a fern? *Native Ferns.* (A Century of Progress pamphlet.) May.
A poison ivy experiment. *Torreya* 33: 65. May–June.

Caparn, Harold A.

- Park damage. *Parks and Recreation* 16: 314. March; 376. April; 411. May.
Park policing. *Parks and Recreation* 16: 450. June; 492. July–August; 17: 9. September.

Cheney, Ralph H.

Coffee species and genetics. *Proceedings Sixth International Congress of Genetics* 2: 385-386. August, 1932 (not reported last year).

Descriptive notes for *Coffea* Linn. exhibit (a detailed report of the Coffee Exhibit at Cornell University in August, 1932). Pages 1-8. Published for distribution in May, 1933.

Phosphate-buffered injection medium disturbance in caffeine effects on voluntary muscle response. *Jour. Pharm. and Exp. Therap.* 48: 470-477. August.

Free, Montague

A vertical garden. *Better Homes and Gardens*. April.

Report of the Horticulturist and Head Gardener for 1932. *Brooklyn Bot. Gard. Record* 22: 102-107. April.

The Brooklyn Botanic Garden exhibit of methods of plant propagation, International Flower Show, March 20-25, 1933. *Brooklyn Bot. Gard. Leaflets* XXI¹. April 5.

Methods of plant propagation. *Brooklyn Bot. Gard. Leaflets* XXI²⁻⁶. April 26.

Pruning roses in spring. *American Rose Annual* 18: 41-46. 1933.

Pruning roses in spring. *Gardener's Chronicle of America* 37: 139. May. (Reprinted from *American Rose Annual*.)

Gager, C. Stuart

Annual report of the Brooklyn Botanic Garden: Report of the Director. *Brooklyn Bot. Gard. Record* 22: 17-52. April.

Plant forms in design. *Bull. Metropolitan Museum of Art* 28: 126-127. July. Reprinted in *Brooklyn Bot. Gard. Record* 22: 172-177. July.

Notes on an American Order of Architecture. *Brooklyn Bot. Gard. Record* 22: 177-180. July.

Graves, Arthur Harmount

Forest pathology. Work on Japanese-American hybrids during 1932. *Brooklyn Bot. Gard. Record* 22: 57-63. April.

Report of the Curator of Public Instruction for 1932. *Brooklyn Bot. Gard. Record* 22: 67-73. April.

29 newspaper articles relating to the Brooklyn Botanic Garden.
4 abstracts in *Biological Abstracts*.

Graves, Arthur Harmount and Hester M. Rusk

A teaching guide to the trees and shrubs of Greater New York.
ix + 76 pp., 2 fig. and map. Published by the authors.
February.

Reed, George M.

Plant Pathology. *Brooklyn Bot. Gard. Record* 22: 53-57.
April.

Rusk, Hester M. and Arthur H. Graves

A teaching guide to the trees and shrubs of Greater New York.
ix + 76 pp. 2 fig. and map. Published by the authors.
February.

Gundersen, Alfred

Report of the Curator of Plants for 1932. *Brooklyn Bot. Gard. Record* 22: 91-96. April.

Shaw, Ellen Eddy

First hand nature study at the Brooklyn Botanic Garden.
School Life 18: 87-88. January.

Report on the children's garden at the Brooklyn Home for Consumptives. *Fifty-first Annual Report of the Brooklyn Home for Consumptives*. p. 26-27. January.

Report of the Curator of Elementary Instruction. *Brooklyn Bot. Gard. Record* 22: 73-82.

The following eight articles appeared in *McCall's Magazine* in the issues indicated:

The small vegetable garden. February.

The garden plan. March.

Shrubs for you and shrubs for me. April.

The child and his garden. May.

Trouble, trouble. June.

Second bloom. July.

House plants. October.

An all-year-round garden. November.

The following 38 articles appeared in the *New York Sun* on the dates indicated:

New members of the perennial family—what seeds to choose.

February 11.

Annals of 1933. February 18.

When and how to start seed. February 25.

The vegetable garden. March 4.

Window boxes—indoors and outdoors. March 11.

Tools and fertilizers. March 18.

The city backyard—what shall we do with it? March 25.

Look out for April Fool jokes in the garden. April 1.

Have you a lily pool? April 8.

Prepare for the garden. April 15.

The commuter's vegetable garden. April 22.

Your perennial garden. April 29.

The annual garden for different soil conditions. May 6.

Vines for every need. May 13.

Set out the dahlias. May 20.

A little pruning now and then. May 27.

Meet the irises! June 3.

What shall I do with my bulbs? June 10.

Sprays for garden troubles. June 17.

What about weeds? June 24.

Cutting back and looking forward. July 1.

Garden gadgets. July 8.

The vegetable garden: its upkeep. July 15.

Make out the bulb order for next year. July 22.

Our climbing roses: their care. July 29.

Stake: restake. August 5.

Perennial lilies. August 12.

Order the evergreens. August 19.

Garden upkeep. August 26.

More suggestions for the bulb order—a last call. September 2.

Preparation of land in the fall. September 9.

Separating plants. September 16.

What shall we plant in the fall? September 23.

How to carry on fall planting. September 30.

- Planting and moving shrubs. October 7.
 The cold frame. October 14.
 Taking up the good old house plant. October 21.
 Taking up summer bulbs and tubers. October 28.

Svenson, Henry K.

- List of Seeds Offered in Exchange. *Brooklyn Bot. Gard. Record* 22: 1-11. January.
 Numerous reviews for *Biological Abstracts*.
 Report of the Associate Curator of Plants for 1932. *Brooklyn Bot. Gard. Record* 22: 96-101. April.

APPENDIX 3

TALKS, LECTURES, ADDRESSES, AND PAPERS GIVEN BY THE BOTANIC GARDEN PERSONNEL DURING 1933

By the Director:

- January 15. *What the Botanic Garden is doing for Brooklyn and Greater New York*. Central Branch, Y. W. C. A.
 February 6. *The civic importance of botanic gardens*. Smith College Alumnae of Brooklyn. At the Garden.
 May 30. *The public services of Mr. Alfred T. White, with special reference to the Brooklyn Botanic Garden*. The Peace Hero Memorial Committee of the Commission on International Justice and Good Will of the Brooklyn Federation of Churches. On the occasion of laying a wreath at the Alfred T. White Memorial Tablet. At the Garden.
 December 27. *Something besides lectures* (with reference to Adult Education). American Nature Study Society. Cambridge, Mass.

By the Curator of Public Instruction:

- April 28. *Forestry*. Abraham Lincoln High School.
 June 27. *The work of the Brooklyn Botanic Garden*. Erasmus Hall High School pupils. At the Garden.

By the Curator of Elementary Instruction:

- January 31. *Graduation address.* P. S. 139.
- February 2. *Graduation address.* Franklin K. Lane High School.
- February 21. *The spring garden.* Garden Department of Upper Montclair Woman's Club, Glen Ridge Woman's Club, and Montclair Garden Club, at Montclair, N. J.
- March 21. *The garden in spring.* Shoreham Garden Club, Shoreham, L. I.
- March 24. *Plants and their work.* Great Neck High School, Great Neck, L. I.
- March 28. *The work of the Brooklyn Botanic Garden.* Tompkins Avenue Congregational Church.
- April 7. *The Brooklyn Botanic Garden.* Fortnightly Library Club. At the Garden.
- April 25. *The flower garden.* Kosmos Club. At the Garden.
- April 26. *Gardens and children.* New York Library Club. At the Garden.
- April 26. *Opportunities offered by the Brooklyn Botanic Garden to the schools.* Teachers of P. S. 186. At the Garden.
- April 27. *Spring.* P. S. 159.
- April 28. *Arbor Day.* Three assemblies, P. S. 185.
- May 2. *May in the garden.* Three Garden Clubs of Great Neck.
- May 4. *Civic contributions of the Brooklyn Botanic Garden.* City Gardens Club. At the Garden.
- May 5. *Address in acceptance of gift in memory of Mrs. M. J. Plough.* Brooklyn Plant, Flower and Fruit Guild. At the Garden.
- May 10. *Address of welcome.* Heads of Department Association. At the Garden.
- May 11. *The work of the Brooklyn Botanic Garden.* Mothers' Club, P. S. 134. At the Garden.
- May 11. *Children's work at the Brooklyn Botanic Garden.* Mothers' Club, P. S. 140. At the Garden.
- May 12. *Gardens for the South Shore of Long Island.* Garden Clubs of Bellport and Westhampton. At the Garden.

- May 16. *The work of elementary schools at the Brooklyn Botanic Garden.* The League of Women Voters. At the Garden.
- May 17. *Tea culture in the Far East.* Brooklyn Ethical Culture School and Friends. At the Garden.
- May 17. *Brooklyn Botanic Garden cooperation with the elementary schools.* Officers of the Garden Club of America. At the Garden.
- May 18. *What the Brooklyn Botanic Garden does for children.* Mothers' Club, P. S. 235. At the Garden.
- May 24. *Raising schoolroom plants.* Brooklyn Section, Public School Kindergarten Association. At the Garden.
- May 25. *Children's work at the Brooklyn Botanic Garden.* Mothers' Club, P. S. 225. At the Garden.
- June 5. *Children's work at the Brooklyn Botanic Garden.* Downtown Luncheon Club. At the Garden.
- June 20. *The Brooklyn Botanic Garden.* People's Institute. At the Garden.
- June 27. *Graduation address.* P. S. 132.
- September 20. *Gardens.* Lily of the Valley Guild, Gerritsen Beach.
- October 2. *Bulbs for classroom planting.* Teachers of Brooklyn and Queens. At the Garden.
- October 4. *Children's work at the Brooklyn Botanic Garden.* Benevolent Society, Marcy Avenue Baptist Church.
- October 6. *Gardens for boys and girls.* Cedarhurst School No. 5.
- October 18. *The outdoor world.* Winnebago County (Illinois) Teachers' Institute, Rural Section.
- October 18. *The home and school garden.* Winnebago County (Illinois) Teachers' Institute, General Section.
- October 18. *Plant propagation as related to the science program.* Winnebago County (Illinois) Teachers' Institute, Junior High School Section.
- October 19. *General nature study.* Winnebago County (Illinois) Teachers' Institute, Primary Section.
- October 19. *Plans and devices for elementary science teaching.* Winnebago County (Illinois) Teachers' Institute, Intermediate Section.

- November 8. *Thanksgiving*. Two assemblies, P. S. 155, Queens.
 November 15. *Plant life: its educational value*. Brooklyn College.
 November 27. *Children's work at the Brooklyn Botanic Garden*. Parent-Teacher Association, P. S. 41.
 December 4. *Nature in education*. Mothers' Club, P. S. 241.
 December 22. *Christmas greens*. P. S. 36.

By the Curator of Plant Pathology:

- April 2. *Iris*. Garden Club of Wyoming Valley, Pittston, Pa.

By the Curator of Plants:

- January 28. *Star Maps and Seasons: Seasons and Time in Nature*. At the Brooklyn Institute, Department of Astronomy.

By the Associate Curator of Plants:

- February 7. *Development of the Local Flora Section*. Woman's Auxiliary of the Brooklyn Botanic Garden. At the Garden.
 December 29. *Ferns of the Galapagos and Cocos Islands*. American Association for the Advancement of Science meeting, Cambridge, Mass.

By the Horticulturist:

- February 4. *Beautiful gardens*. Maine Women's Club.
 April 4. *Everyday garden practices*. School for Ornamental Gardeners, Dept. of Floriculture, University of Maryland.
 April 5. *Rock garden construction*. School for Ornamental Gardeners, Dept. of Floriculture, University of Maryland.
 June 13. *Origin of garden roses*. Rose Garden Day. At the Garden.
 June 14. *Making a rock garden*. Field Day of the New Jersey State Experiment Station, New Brunswick.
 June 19. *Roses*. Mt. Vernon Garden Club.
 October 16. *Berry-bearing shrubs*. Nathan Hale Garden Club, Huntington.

By Instructors:*Miss Dorward:*

- March 17. *Window boxes.* New York Public Library Group.
 June 21. *Continuous bloom in the garden.* Garden Club of Yorktown.

Miss Jenkins:

- February 28. *The educational work of the Brooklyn Botanic Garden.* P. S. 115.
 March 22. *Birds and their service to man.* P. S. 238.
 April 4. *Gardening for children.* Mothers' Club, P. S. 167.
 April 10. *Preparation for the outdoor garden.* Teachers of Brooklyn and Queens schools. At the Garden.
 April 24. *What to plant in a school garden.* Teachers of Brooklyn and Queens schools. At the Garden.
 April 27. *How to start a backyard garden.* Bedford Branch, Brooklyn Public Library.
 April 28. *Arbor Day.* P. S. 142.
 May 25. *Gardens.* P. S. 165.
 July 25. *Flower arrangement.* Valley Garden Club of Spring Valley, N. Y.
 September 25. *The school garden in the fall.* Teachers of Brooklyn and Queens schools. At the Garden.
 November 10. *Flower arrangement.* Plandome Garden Club.
 December 27. *By-products of a children's garden.* American Nature Study Society, Boston, Mass.

Miss Miner:

- February 20. *Plants and their seeds.* Three assemblies, P. S. 117, Queens.
 June 8. *The Brooklyn Botanic Garden.* Parents' Association, P. S. 219. At the Garden.
 October 9. *The school window box and the terrarium.* Teachers of Brooklyn and Queens schools. At the Garden

By the Resident Investigator (Economic Plants):

- March 2. *The Genus Coffea* Linn. Rutgers University Biology Seminar.
- December 11. *Relation of coffee and caffeine to human efficiency.* New York Branch, American Pharmaceutical Association. Brooklyn College of Pharmacy.

APPENDIX 4

RADIO TALKS BY THE BOTANIC GARDEN
PERSONNEL DURING 1933

By the Horticulturist:*From Station WOR**

- January 5. Plants for the aquarium.
- February 9. Repotting house plants.
- March 30. Bloom the year round in the garden.
- April 20. Planting trees, shrubs and evergreens.
- May 18. Planting the annual garden.
- June 8. Inspecting famous gardens.
- August 17. Starting perennials from seed.
- August 28. Planting the rock garden.
- September 18. Plants for hedges.
- November 6. Fall planting in the rock garden.
- December 22. Christmas plant folk lore.

From Station WNYC

- August 24. August in the garden.
- October 19. October in the garden.
- November 16. November in the garden.
- December 14. Putting the garden to bed.
- December 28. Winter pruning.

* Radio Garden Club addresses given in connection with Co-operative Extension Work in Agriculture and Home Economics of the State of New Jersey.

By the Curator of Public Instruction (Station WNYC):

October 12. The educational program at the Brooklyn Botanic Garden.

October 26. Some features of especial interest at the Brooklyn Botanic Garden.

November 9. What to see at the Brooklyn Botanic Garden.

November 23. Plant breeding at the Brooklyn Botanic Garden.

December 7. Can we bring back the chestnut tree?

December 21. Can we bring back the chestnut tree? (Concluded).

By the Associate Curator of Plants (Station WOR):

July 20. Growing wildflowers.

By the Curator of Elementary Instruction:

From Station WINS

April 8. Gardens for one and all.

From Station WNYC

October 5. Fall gardening at the Brooklyn Botanic Garden.

November 30. The travels of a Thanksgiving dinner.

By Instructors (Miss Jenkins). Station WNYC:

August 3. The children's garden of the Brooklyn Botanic Garden.

September 14. The Japanese Garden at the Brooklyn Botanic Garden.

APPENDIX 5**FIELD TRIPS CONDUCTED****By the Curator of Plants:**

August 26-30. Torrey Botanical Club in the Catskills.

APPENDIX 6

MEETINGS OF ORGANIZATIONS AT THE
GARDEN 1933

- February 6. Smith College Club.
- February 7. Woman's Auxiliary, Brooklyn Botanic Garden.
- April 3. Woman's Auxiliary, Brooklyn Botanic Garden.
- April 7. Fortnightly Club.
- April 15. Writers' Club of Brooklyn.
- April 18. St. Mary's Hospital Guild.
- April 19. Dr. White Memorial Catholic Settlement Association.
- April 20. Boy Scouts of America, Woodmere, Long Island.
- April 25. Kosmos Club.
- April 26. New York Library Club.
- April 26. Teachers Club of P. S. 186, Brooklyn.
- April 27. Contemporary Club.
- April 28. Shoreham Garden Club.
- May 1. Schola Club of Brooklyn.
- May 3. Women of '76, N. S. D. A. R.
- May 3. Christ Child Society.
- May 4. City Gardens Club.
- May 5. Prince Bay Woman's Club of Staten Island.
- May 5. Brooklyn Plant, Flower and Fruit Guild.
- May 6. Reconciliation Tours.
- May 8. Caldwell (N. J.) Garden Club.
- May 8. Woman's Aid Society of the Japanese M. E. Church.
- May 10. Brooklyn Heads of Department Association.
- May 10. Catholic Alumnae Group.
- May 11. Hollis Woman's Club.
- May 11. Mothers' Club, P. S. 140.
- May 11. Chiropean Club.
- May 11. Mothers Club, P. S. 134.
- May 12. Bellport-Westhampton Garden Club.
- May 13. Writers' Club of Brooklyn.
- May 14. Temple Emanuel Religious Group.
- May 15. Peninsula College Woman's Club.
- May 16. League of Women Voters.

- May 17. Officers of the Garden Club of America.
 May 17. Brooklyn Ethical Culture Exhibit.
 May 18. Business Girls of Central Branch Y. M. C. A., Brooklyn.
 May 18. Mothers Club, P. S. 235.
 May 30. Brooklyn Federation of Churches, Committee for Honoring Peace Time Heroes.
 June 1. Brooklyn Girl Scouts.
 June 5. Downtown Luncheon Club.
 June 6. Ellen Hardin Walworth Chapter, N. S. D. A. R.
 June 7. Chaminade Club.
 June 8. Mothers Club, P. S. 219.
 June 8. Minisink Garden Club.
 June 9. Horticultural Society of New York.
 June 15. Brooklyn College Faculty and Seniors.
 June 21. People's Institute.
 October 9. Illuminati Club.
 October 10. Department of Botany. Brooklyn Institute of Arts and Sciences.

	1931	1932	1933
Number of organizations	23	59	49
Total attendance	1,146	2,741	3,357

APPENDIX 7

REPORT ON PHOTOGRAPHIC WORK

Negatives on file December 31, 1932	8,400
Negatives accessioned during 1933	144
Total negatives on file December 31, 1933	8,544
Lantern slides on file December 31, 1932	6,105
Lantern slides discarded during 1933	30
	6,075
Lantern slides accessioned during 1933	15
Total lantern slides on file December 31, 1933	6,090

Prints on file December 31, 1932	4,776
Prints made during 1933	313
Used or distributed	169
Prints filed during 1933	144
 Total prints on file December 31, 1933	 4,920
Enlargements made	9

Respectfully submitted,

FRANK STOLL,
Registrar.

APPENDIX 8

REPORT ON BROOKLYN BOTANIC GARDEN PUBLICATIONS, 1933

American Journal of Botany

Official Organ of the Botanical Society of America

Volume XX (1933) comprised, as usual, ten monthly issues (omitting August and September), with 53 papers, 696 pages, 48 plates, and 280 text figures (as against 63 papers, 865 pages, 57 plates, and 387 text figures in 1932). Dr. Arthur Harmount Graves continued on the editorial board as representative of the Brooklyn Botanic Garden. Professor Sam F. Trelease, of Columbia University, continued as Editor-in-Chief.

The circulation at the close of the fiscal year (November 30, 1933) was 1,582 as against 1,697 one year ago. The annual budget was \$12,294.38 as against \$14,523.64 in 1932. The year closed with a credit balance of \$2,648.78 and assets over liabilities of \$1,010.43 plus the value of back sets and volumes on hand.

Ecology

Official Organ of the Ecological Society of America

Quarterly. Volume XIV comprised 28 papers (besides reviews, proceedings, and miscellaneous matter), 420 pages and 138 text figures (as against 35 papers, 424 pages and 109 text figures in 1932). The circulation at the close of the fiscal year (November 30, 1933) was 943 as against 1,160 one year ago.

The annual budget was \$5,046.50, the credit balance \$899.70 and assets over liabilities \$985.18 (against \$5,286.64, \$1,727.37 and \$1,156.71 assets over liabilities in 1932) plus the value of back sets and volumes on hand. Dr. Henry K. Svenson continued on the editorial board as the Brooklyn Botanic Garden representative. Prof. Alfred E. Emerson and Prof. George D. Fuller, both of the University of Chicago, continued as Editor and Associate Editor, respectively.

Genetics

In Co-operation with the Editorial Board of Genetics

Bimonthly. Volume XVIII comprised 31 papers, 555 pages, 6 plates, and 91 text figures (as against 34 papers, 711 pages, 13 plates, and 97 text figures in 1932). At the close of the fiscal year (November 30, 1933) the circulation was 610, the annual budget \$5,966.98, the credit balance \$1,531.01, and assets over liabilities \$1,630.38 (as against 657, \$5,822.13, and \$983.01 in 1932), plus the value of back sets and volumes on hand. Dr. Donald F. Jones, Connecticut Agricultural Experiment Station, continued as Managing Editor.

Brooklyn Botanic Garden Record

Beginning with the issue for January 1933 (Volume XXII, No. 1), the Botanic Garden Record was changed from a bimonthly to a quarterly, as it was previous to 1929. Volume XXII comprised 212 pages. The April number comprised the Annual Report. The circulation of the Record at the close of the year was 1,615.

Leaflets

One single number, 1 double number, and 1 quadruple number were issued. The circulation as of December was 1,939 copies. Dr. Arthur Harmount Graves, curator of public instruction, is the editor.

Contributions and Memoirs

None were published during 1933.

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* Deceased.

- Lyman, Frank
 Lynde, Mrs. Martha R.
 Macbeth, Robert W.
 MacDonald, Rev. Robert
 Mason, William P.
 Mathews, Mrs. Albert H.
 Maxwell, Henry L.
 May, Joseph M.
 Maynard, Edwin P.
 McAneny, Hon. George
 McConnell, Rev. S. D.
 McKay, Mrs. John S.
 McLaughlin, Hon. George V.
 Melish, Rev. John H.
 *Mercer, Rev. Arthur
 Metcalf, Jesse
 Moffat, David
 Moffat, William L., Jr.,
 Moore, Mrs. W. H.
 Morgan, John Hill
 Morse, Miss Alice L.
 Morse, Charles L.
 Mundhenk, Herman
 Murray, Thomas E., Jr.
 O'Connor, Mrs. W. B.
 Ogilvie, Donald Manson
 Orr, Miss Mary Moore
 Osborne, Mrs. Dean C.
 Packard, Miss Mary S.
 Paige, Clifford E.
 Palmer, Henry L.
 Parker, Asa W., Jr.
 Parker, Gordon
 Peet, Mrs. Louis Harmon
 Pierrepont, John J.
 Pierrepont, Seth Low
 Polhemus, Miss R. A.
 Potts, Maj. Charles E.
 Pratt, Charles
 Pratt, Mrs. Frederic B.
 Pratt, Frederic B.
 Pratt, Harold I.
 Prentiss, Russell E.
 Prosser, Thomas
 Prosser, Thomas Harold
 Prosser, Walter R.
 Putnam, Harrington
 Putnam, Mrs. William A.
 Ramsdell, Mrs. F. Van N.
 Robinson, George C.
 Robinson, Dr. Nathaniel
 Ruger, Mrs. Adolph
 *Ruland, Irving A.
 Ruscoe, Miss Rose
 Russell, James T., Jr.
 Russell, Mrs. Talcott H.
 Sackett, Charles A.
 Sanbern, Mrs. Frank H.
 Schenck, Miss Eunice M.
 Schieren, Harrie Victor
 Shaw, Robert Alfred
 Sheldon, Mrs. Anna B.
 Sheldon, Henry
 Smith, G. Foster
 Snow, Helmer
 Squier, Frank
 Stevens, Mrs. Roy G.
 Stevens, Shepherd
 Stewart, Douglas MacC.
 Stokes, Mrs. S. Emlen
 Stutzer, Miss Elise W.
 Sullivan, Andrew T.
 Taylor, Miss Bessie
 Taylor, Mrs. Helen S.
 Taylor, William H.
 Thayer, Mrs. Anna K.
 Thursby, Miss Ina
 Tucker, Mrs. George S., Jr.
 Turner, Mrs. Bertha C.
 Tuthill, Miss Isabel H.
 Valentine, P. A.
 Van Anden, Miss Susan M.
 Van Sinderen, Mrs. Adrian
 Van Sinderen, Adrian
 Wagner, Miss Marie
 Walbridge, Robert R.
 Warbasse, Mrs. James P.
 Ward, Miss Helen
 Warner, Dr. Edwin G.
 Weber, Mrs. Herman C.

* Deceased.

Webster, Mrs. Edward H.
 White, Harold T.
 White, S. V.
 Whitney, Sumner B.

Wisner, Mrs. Horatio S.
 Woodward, Miss Mary Blackburne
 York, Rt. Rev. Mgr. John C.
 Zabriskie, Mrs. Cornelius

SUSTAINING MEMBERS¹

By payment of \$25 annually

Adams, Charles S. (M)	Leech, Mrs. John E. (G)
Anderson, John (G)	Liebman, Mrs. Chas. J. (M)
Babbott, Dr. Frank L., Jr. (M)	Logan, Miss Anna A. (E)
Barnes, Raymond F. (E)	Loomis, Guy (M)
Beardsley, Mrs. Louise T. (E)	Lorence, Louis (E)
Boetticher, Miss E. C. (G)	Morton, Dr. L. J. (M)
Bryant, Miss Helen W. (G)	Noyes, Mrs. Charles F. (G)
Campbell, Miss Mary (M)	*Parke, Mrs. William More (E)
Doolittle, Mrs. R. Edson (E)	Pasternack, Mrs. Richard (M)
Doscher, Mrs. Charles (M)	Perkins, Mrs. Charles E. (E)
Edwards, Mrs. Wm. Seymour (M)	Pierrepont, Miss Julia J. (M)
*Enequist, John (G)	Price, Mrs. William H. (M)
Faber, Lee W. (M)	Reimer, Miss Margareth B. (M)
Field, Mrs. W. D. C. (M)	Richter, Miss Jessie H. (M)
Froeb, Charles (M)	Robinson, J. J. (M)
Frothingham, John W. (M)	Rossin, Alfred S. (M)
Good, Mrs. William H. (M)	Rothschild, Simon F. (G)
Hart, Miss Lauribel (E)	See, Alonzo B. (M and G)
Havemeyer, T. A. (G)	Uhrbrock, Mrs. E. F. (G)
Hincken, Miss Elsie O. (G)	Underwood, Mrs. John T. (M)
Ingraham, Edward A. (G)	Valentine, Miss C. F. (G)
Ingraham, Mrs. Henry C. M. (G)	Weber, F. C. (E)
Jenkins, Mrs. John Sloane (M)	White, Mrs. Alexander M. (G)
Judge, James P. (M)	Wood, Miss Emily S. (E)
Kirkman, Mrs. A. S. (M)	Wood, Mrs. Thomas B. (M)
Lambert, Frank (M)	Zabriskie, Mrs. Cornelius (G)
Latimer, Miss Mary (G)	Zoebisch, Mrs. C. T. (M)
Leary, Mrs. Arthur R. (E)	

¹ (G), Through the Botanic Garden; (M), Museum; (E), Educational Department.

* Deceased.

BROOKLYN BOTANIC GARDEN ANNUAL MEMBERS

By payment of \$10 annually

- | | |
|-----------------------------|----------------------------------|
| Adams, Henry S. | Blackman, Dr. William W. |
| Affeld, F. O. | Blankley, Miss A. Grace |
| Almirall, Mrs. Juan A. | Blatchford, Miss Stella |
| Altenbrand, Mrs. A. | Bleckman, Elias |
| Ammarell, Mrs. Bertha E. | Bleimeyer, Miss Rose |
| Anderson, Mrs. John | Blum, Mrs. Edward Charles |
| Anderson, William W. | Boardman, Mrs. George M. |
| Andrews, Miss Grace | Bohm, Albert |
| Ashton, Thomas J. | Bornmann, Dr. Alfred |
| Atkin, Miss Lillian | Bossert, John |
| *Atkins, Miss Annie G. | Bossert, Mrs. L. |
| Atwood, Mrs. George D. | Boys' High School, Brooklyn |
| Auerbach, Dr. Romeo W. | Bradley, Miss Florence |
| Babbott, Mrs. Frank L., Jr. | Braman, Miss Irene M. |
| Babcock, Mrs. C. Lynde, Jr. | Brewster, Mrs. Walter Shaw |
| Bachman, Mrs. C. M. | Brinsmade, Miss Alice |
| Bacon, Mrs. Robert | Britton, Dr. N. L. |
| Bailey, Mrs. A. W. | Brockaway, Mrs. Otilia A. |
| Ballin, Mrs. Rose L. | Brooklyn Plant, Flower and Fruit |
| Banker, John F. | Guild |
| Beatty, Dr. George Wesley | Brower, Miss Edith D. |
| Beck, Mrs. Anna W. | Brower, Miss Elizabeth |
| Becker, Frederick W. | Brower, Frank Daniel |
| Becker, Miss Johanna L. | Brower, Mrs. George E. |
| Bedford, Mrs. Clark | Brown, Mrs. G. Stewart |
| Beers, John Frank | Brown, Mrs. R. S. |
| Behr, Edw. A. | Brown, Roscoe C. E. |
| Benedict, Mrs. Albert R. | Brown, Mrs. Samuel A. |
| Bennett, Miss Josephine M. | Brown, Mrs. Samuel T. |
| Benson, Mrs. Philip A. | Browne, Mrs. R. B. |
| Berman, Harold | Browning, Dr. William |
| Berman, Mrs. Judith H. | Bruckenfelf, Morris |
| Bershad, Mrs. Frances B. | Buckley, Miss Jane T. |
| Bestint, Samuel | Burkard, Mrs. Anna |
| *Betsch, William G. L. | Butler, Edward M. |
| Betts, Miss Dorothy L. | Butterick, Miss Mary E. |
| Bildersee, Miss Adele | Cabot, Dr. Irving L. |
| Binks, Herbert H. | Cadman, Mrs. Frederick L. |
| Bishop, Mrs. Elizabeth L. | Cahoone, Richard M. |
| Bittner, Mrs. L. | Calder, Hon. William M. |
| *Bixby, Willard G. | Caldwell, Mrs. Helen W. |
| *Blackman, Mrs. Edwin L. | Camp, Miss Caroline D. |

* Deceased.

- Campbell, Miss Mary
 Canis, Prof. Otto P. M.
 Carey, Mrs. Maude B.
 Carroll, Mrs. Otis Swan
 Carter, Mrs. Oliver Goldsmith
 Cary, Mrs. William H.
 Castner, Mrs. Frank Mason
 Cedarhurst Garden Study Group
 Chaffee, Mrs. D. Dwight
 Chanin, Irwin S.
 City Gardens Club
 Clark, Miss Agnes B.
 Clark, Miss Jeannette
 Clark, Dr. Raymond
 Coffin, Mrs. I. Sherwood
 Coleman, Mrs. D.
 Collin, Miss A. Maude
 Collins, Mrs. H. S.
 Contemporary Club, The
 Corcoran, James J.
 Costantino, Mrs. R.
 Cottrell, Frederick A.
 Cotz, Victor
 Coutts, Miss Frances H.
 Cowell, Mrs. Thaddeus G.
 Coykendall, Mrs. W. E.
 Cranford, Frederick L.
 Cranford, Miss Margaret
 Cranford, Mrs. Walter V.
 Cruikshank, Russell V.
 Cruikshank, Mrs. Russell V.
 Currie, Mrs. James N.
 Cuthrell, Mrs. Faith B.
 D'Albora, Dr. John B.
 Dana, Mrs. Arnold Guyot
 Dana, Mrs. Arthur D.
 Dann, James E.
 Darrigrand, Miss Lucie P.
 Darrow, Mrs. Wirt E.
 Dauernheim, A. M.
 Davenport, Mrs. Henry J.
 Davidson, Mrs. John
 Davison, Mrs. George Millard
 Decker, Mrs. Charles A.
 deComps, Miss Pauline C.
 Delafield, Mrs. John R.
 Delclisur, Mrs. Arthur C.
 Demoret, Miss Ruby
 Denbigh, Miss Helen D.
 De Silver, Mrs. Albert
 De Voe, Mrs. Franklin M.
 deWaal, Mrs. Christian
 Dickey, Miss Annie Louise
 Dietz, Nicholas
 Diller, Mrs. Frank J. W.
 Ditmas, Miss Caroline
 Doane, Albert C.
 Dodge, Mrs. Francis D.
 Doherty, Mrs. Philip A.
 Doman, Mrs. Samuel H.
 Donoho, Mrs. Roger
 Donovan, Miss Loretto V.
 D'Orsi, Miss Theresa
 Douglaston Garden Club
 Dreher, Miss Hertha M.
 Dreier, Mrs. H. Edward
 Duncan, Mrs. Cameron
 du Pont, Mrs. T. Coleman
 Dusseldorf, Mrs. Louis M.
 DuVal, Guy
 DuVal, Mrs. Guy
 Earle, Mrs. Wm. P., Jr.
 Eckardt, Mrs. Remick C.
 Eckstein, Harry
 Edinburg, Mrs. William G.
 Edson, Mrs. John Jay, Jr.
 Eilers, Miss Emma
 Elbert, William
 Elbert, Mrs. William
 Eldert, Mrs. Cornelius
 Elliott, Mrs. F. E.
 Elmer, Mrs. Charles W.
 Elmer, Mrs. S. Lewis
 Epstein, Herbert
 Ericson, Carl O.
 Ericsson, Miss H. Wilhelmina
 Ernstorff, Joseph W.
 Espenschied, Mrs. Anne E.
 Etzel, Mrs. Mary M.
 Everit, Mrs. Edward A.
 Fairbanks, Miss Maria B.
 Fairchild, B. T.

- Fairchild, Mrs. Frank K.
 Far Rockaway Women's Club:
 Garden Group
 Fardelman, Mrs. A. Von Prief
 Fawcett, Judge Lewis L.
 Feld, Miss Estelle
 Feldman, Herbert
 Ferris, Mrs. Joseph W.
 Ferris, Miss Amy
 Field, Frederick
 Fisher, Miss Edna M.
 Fisher, Mrs. S. L.
 Fiske, Mrs. Rodney
 Fitzhugh, Mrs. William W., Jr.
 Fleming, Mrs. Thomas R.
 Flushing Garden Club, Inc.
 Fogel, Louis E.
 Ford, Mrs. Sumner
 Fortnightly Library Club
 Forward, Mrs. D. A.
 Foster, Miss A. M.
 Fox, Mrs. Mortimer J.
 Frank, Miss Rose
 Frauson, Mrs. George E.
 Frohne, Mrs. Theodore
 Fuchs, Julian
 Fuchs, Miss Louise
 Fulda, Mrs. H. C.
 Fultz, Mrs. Marjorie
 Gaillard, Mrs. William Dawson
 Gale, Mrs. Alexander B.
 Gallagher, Miss Augusta
 Garden Branch of the Hollis
 Woman's Club
 Garden Club of Laurence
 Gardiner, Mrs. A. S.
 Gardner, James P.
 Gearon, Mrs. E. A.
 Gerwin, Mrs. Sarah
 Getreu, Miss Adele K.
 Gibson, Miss Gertrude
 Gillingham, Mrs. Catherine R.
 Gillingham, James L.
 Girls Commercial H. S., Brooklyn
 Girls' High School, Brooklyn
 Gladding, Walter M.
 Goddard, Mrs. Eleanor S.
 Goetze, Mrs. Otto
 Gonnoud, A. J.
 Goodfellow, Mrs. M. P.
 Goodman, Joseph
 Gordon, Dr. Onslow A., Jr.
 Graham, Dr. J. C.
 Grasty, Mrs. Mabel R.
 Great Neck Garden Club
 Great Neck Woman's Club: Garden
 Committee
 Griffin, Frank E.
 Gunnison, Mrs. Herbert F.
 Guyer, Louis G., Sr.
 Haas, Miss Edith
 *Hadden, Crowell
 Haff, Mrs. Alvah C.
 Haggerty, Mrs. John J.
 Hagstrom, Mrs. Henry Theodore
 Halstead, Miss A. E.
 Halstead, Mrs. J. Morton
 Halstead, Mrs. Kenneth B.
 Halsted, Mrs. Henry M.
 Hamilton, Mrs. George S.
 Hanks, Miss Lenda T.
 Hanson, George C.
 Hargitt, Dr. Chas. A.
 Harris, Mrs. Augustus
 Harris, Mrs. Sarah L.
 Harrison, Mrs. Joseph Duke
 Harisson, Mrs. Stephen M.
 Hatheway, Mrs. Philip M.
 Havens, Mrs. V. B.
 Hawes, Dr. Edward S.
 Haynes, Mrs. Edward
 Haynes, Miss Mabel
 Healy, D. J.
 Hearn, Mrs. Frank T.
 Heath, Royal V.
 Hecht, Miss Sadie
 Hegeman, Mrs. D. V. B.
 Heissenbittel, Mrs. Henry C.
 Heissenbittel, Mrs. Wm. F.
 Heller, Dr. Jacob

* Deceased.

Helm, Mrs. Gustave A.
 Henning, Mrs. George
 Herschler, Mrs. Freda
 Herlehy, Mrs. Frances E.
 Hester, Mrs. W. V., Jr.
 Hetkin, Henry
 Higgins, Dr. Alice K.
 Hill, Mrs. Robert C.
 Hills, Mrs. James M.
 Hinchman, Mrs. Ralph P.
 Hirschberg, Benjamin
 Hoag, Mrs. J. Edward
 Hodenpyl, Anton G.
 Hoffmann, Mrs. George J.
 Hollenback, Miss Amelia B.
 Hollwegs, Miss Anna
 Hollwegs, Miss Katherine
 Howe, Mrs. Arthur M.
 Hoyt, Miss Anne S.
 Hoyt, Miss Mary F.
 Hume, Mrs. Henry M.
 Hume, Mrs. Russell S.
 Humpstone, Mrs. O. Paul
 Hunter, Mrs. William T.
 Hutton, Miss Sarah E.
 Iffla, Miss Florence E.
 Ingersoll, Mrs. Raymond V.
 Ingraham, Miss Grace
 Ingraham, Henry A.
 Ingraham, Dr. Ruth
 Irish, William S.
 Irwin, Mrs. Henry, Jr.
 Jackson, Edward
 Jackson, Mrs. Rickard
 Jadwin, Mrs. Palmer H.
 Jadwin, Mrs. Stanley P.
 James, Mrs. Darwin R., Jr.
 James, Mrs. Warner
 James, William L.
 Jameson, Mrs. A. Stedman
 Jameson, Dr. P. Chalmers
 Jameson, Mrs. P. Chalmers
 Jansen, Miss Dora
 Jantzer, George E.
 Jeck, Mrs. Katherina

Jenks, Mrs. W. P.
 Jennings, Miss Annie B.
 Jennison, Miss Rosalie O.
 Jewell, John V.
 Johanns, Mrs. Frederick L.
 Johnson, Mrs. David C.
 Johnston, Mrs. F. Cliffe
 Johnston, Miss Florence
 Johnstone, Mrs. Freda A.
 Jones, Miss Helen Swift
 Jones, Mrs. Jane Bates
 Jones, Mrs. Wallace T., Jr.
 Jones, Mrs. Wallace Thaxter
 Jourdan, James H.
 Judd, Mrs. Orin R.
 Kaplan, Miss Esther Beatrice
 Kasper, Dr. Gerard
 Kaufman, I. C.
 Kay, Miss Lillian S.
 Keating, Miss Margaret R.
 Kennedy, Mrs. James
 Kennedy, Mrs. William, Jr.
 Ketcham, Miss Clara L.
 King, Mrs. Warner
 Kirk's School, Miss
 Klempner, Mrs. Ida
 Knox, Miss Maria
 Kohn, Mrs. Florence K.
 Kolb, William D. A.
 Korey, Miss Ruth A.
 Kovaleff, Miss Augusta
 Kunz, Mrs. M. R.
 Lafrentz, F. W.
 Lancaster, Miss Bertha
 Lane, Miss Ella M.
 Lane, Mrs. LeRoy C.
 Langdon, Palmer H.
 Lanman, D. H.
 Lathrop, Mrs. Henry R.
 Lathrop, Mrs. John H.
 Lea, Mrs. Robert B.
 Leeming, Mrs. T. L.
 Lehrenkrauss, Julius
 Leonhardt, Dr. H. H.
 Lester, Mrs. Maxwell

* Deceased.

- Levin, Miss Anna C.
 Levingson, Isaac
 Lewis, Clarence McK.
 Lily of the Valley Guild
 Lincoln, Mrs. Roy M.
 Lippincott, Miss Alice C.
 Litchfield, Miss Cornelia
 Loines, Miss Elma
 Loines, Mrs. Stephen
 Long, Mrs. Walter Pratt
 Losee, Mrs. Herbert I.
 Lott, Mrs. Henry DeWitt
 Love, John H.
 Lubrecht, Mrs. Charles A.
 Lucia, Dr. William A.
 Lyons, Edward
 MacCauley, Miss Minnie
 MacKay, Mrs. M. S.
 Mackey, Miss Mary R.
 Mansfield, Miss Louise Buckingham
 Manville, Mrs. H. Edward
 Marine Park Garden Club
 Marks, Mrs. Alexander D.
 Marshall, Mrs. William W.
 Matheson, Mrs. C.
 Maxwell, Mrs. Earl C.
 Maynard, Mrs. Edwin P.
 Maynard, Mrs. Edwin P., Jr.
 McCammon, Miss Althea
 McCarroll, Mrs. William R.
 McCarthy, Edward Joseph
 McCarthy, Miss Mildred H.
 McCormick, Mrs. E.
 McDermott, Mrs. Arthur
 McDonald, Dr. Milo F.
 McHugh, Mrs. Mary F.
 McKelway, Mrs. St. Clair
 McKenzie, Mrs. Andrew C.
 McLaren, James R.
 McLean, Mrs. F. B.
 McNeill, Malcolm, Sr.
 McTiernan, Miss Mary
 Mead, D. Irving
 Meeker, Samuel M.
 Meissner, Mrs. William C.
 Mellen, Mrs. Graham K.
 Mellucci, Angelo
 Melville, Mrs. Frank
 Mercelis, Mrs. Edo E.
 Merovitz, Mrs. Annie E.
 Merrill, Mrs. Whitney
 Merritt, Miss Lilla H.
 Meyenborg, Miss Evelyn A.
 Michelsen, Mrs. Letitia M.
 Milliken, Miss Anne M.
 Monroe, Mrs. J. D.
 Montgomery, Mrs. C. H.
 Mooney, James A.
 Morgan, Miss Charlotte E.
 Morin, Mrs. George K.
 Morse, Miss Alice L.
 Moul, Mrs. John F.
 Mudge, Mrs. Alfred E.
 Müller, Adolf
 Mullikin, Mrs. Richard
 Munkenbeck, Earl T.
 Munson, Miss Katherine F.
 Murchie, Wilfred E.
 Murray, Mrs. Joseph Bradley
 Myers, Miss Elizabeth Paul
 Myerson, Mrs. M. C.
 Neal, Mrs. William J.
 Needham, Henry C.
 Nellis, Dr. Frank G.
 Nesmith, Miss Charlotte
 Nevin, Julius O. E.
 Newman, Miss Louise M.
 Nichols, Mrs. Carroll Leja
 Noonan, Mrs. Martha
 North, Mrs. John H.
 Novack, Miss Bessie
 Noyes, Mrs. Charles F.
 Nurick, Miss Helen D.
 O'Brien, Mrs. John Fell
 O'Brien, Miss Mary M.
 O'Donohue, Mrs. Charles A.
 Ohly, Dr. John H.
 O'Neill, Charles E.
 Ormsbee, Mrs. Malcolm H.
 Osborne, Mrs. Dean C.
 Otis, Mrs. Charles H.
 Paffard, Mrs. Frederic C.

- Pallister, Mrs. C. V.
 Palmer, Miss Emma J.
 Parker, Mrs. Clinton B.
 Parker, Mrs. Elizabeth B.
 Parrish, Dr. John W.
 Parshelsky, Moses L.
 Parsons, Frank H.
 Pashley, Mrs. Charles L.
 Pass, Miss Beatrice
 Pass, Miss Rosalind
 Paumanacke Garden Club
 Peace, Miss Dorothy
 Pearsall, Samuel
 Peck, Mrs. Bayard L.
 Peck, Fremont C.
 Peckham, Mrs. Wheeler H.
 Peloubet, Mrs. S. W.
 Pendás, Mrs. M. B.
 Pa. School of Horticulture for
 Women
 Penzer, Abraham
 Perkins, Mrs. Charles E.
 Perry, George H.
 Perry, Mrs. John M.
 Peters, Mrs. Wm. Sterling
 Petrocelli, Mrs. J.
 Pfeiffer, Miss C. A.
 Phenix, Mrs. Spencer
 Pierrepont, Miss Anna J.
 Pierrepont, Miss Julia J.
 Pillsbury, Mrs. E. H.
 Pinkerton, Mrs. Robert A.
 Place, Mrs. E. Clifford
 Platt, Mrs. Augustine R.
 Platt, Miss E. L.
 Plump, Miss Julia H.
 Pond, Miss Pearl F.
 Pond, William H.
 Popper, Mrs. William C.
 Porter, Mrs. E. Pender
 Post, Miss Elizabeth W.
 Post, Mrs. James H.
 Post, Miss Jessie W.
 Potter, Mrs. R. Burnside
 Powers, Miss Z. A.
 Pratt, Abram J.
 Pratt, Frederic B.
 Pratt, Harold I.
 Pratt, Mrs. Katherine Sloan
 Pratt, Miss Mary
 Pratt, Mrs. Nathaniel W.
 Pratt, Mrs. Richardson
 Price, Frank J.
 Prince, Mrs. Benjamin
 Prosser, Mrs. Alfred L.
 Prosser, Miss Ella W.
 Provost, Miss Eva M.
 Public School 102, Brooklyn
 Public School 155, Brooklyn
 Public School 202, Brooklyn
 Pulis, Mrs. Samuel C.
 Purdie, Miss Bertha S.
 Purdy, Miss Maud H.
 Raiman, Mrs. Robert I.
 Rathbun, Mrs. Nathaniel
 Redstone, Jacob Leonard
 Reed, Mrs. George M.
 Reimer, Mrs. Otto E.
 Reinhardt, Mrs. Charles
 Remsen, Miss Catherine A.
 Reynolds, Mrs. Lewis G.
 Richardson, William C.
 Rider, Lloyd A.
 Ripin, Miss Sadie N.
 Ris, Mrs. Bernard
 Roberts, Mrs. John S.
 Roberts, Miss Willa
 Robson, Mrs. Maurice
 Roe, Mrs. Clinton T.
 Rogers, Mrs. Charles E.
 Romanovsky, Dimitry
 Rooney, Mrs. Mary T.
 Rosati, Dr. Vincent F.
 Rowe, Mrs. Frederick W.
 Ruckgaber, Mrs. Louis A.
 Rushmore, Dr. Jacques C.
 Sanborn, Mrs. Frederic B.
 Sanders, Edward I.
 Sargent, Mrs. William Denny
 Sartori, Joseph J.
 Satterlee, Mrs. Herbert L.
 Schiller, Miss Frances

- Schlein, Dr. Julius
 Schlossberg, A.
 Schnur, Miss Mildred
 Schoonhoven, John J.
 Scoville, Mrs. Herbert
 Seibert, Mrs. Albert E.
 Sellew, Mrs. Waldo W.
 Sessler, David
 Shapiro, Mrs. Clara
 Shapiro, Miss Frances
 Shattuck, Mrs. Warren S.
 Shaw, Miss Agnes M.
 Shaw, Mrs. Aubrey N.
 Shaw, Robt. Alfred
 Shaw, Dr. W. Fawcett
 Shay, Dr. James J.
 Shepard, Charles S.
 Sherman, Mrs. A. W.
 Shoreham Garden Club
 Siebert, Mrs. William
 Simpson, Miss Etta
 Simpson, Mrs. T. A.
 Simrell, George W., Jr.
 Smith, B. Herbert
 Smith, Miss Bertha H.
 Smith, George W.
 Snyder, Dr. Wm. H.
 Solomon, Miss Eleanor
 Southard, Miss Edith Brett
 Spencer, Howard C.
 Spingarn, Mrs. Arthur B.
 Spingarn, J. E.
 Spingarn, Mrs. J. E.
 Spring, Mrs. Benjamin F.
 Spring, Miss M. Louise
 Squillance, Dr. J. A.
 Staber, Miss Maud J.
 Stanley, Mrs. A. W.
 Stanley-Brown, Joseph
 Starkweather, Mrs. A. K.
 Stasek, Joseph
 Stedman, Mrs. J. W.
 Steele, Mrs. Frederic T.
 Steele, Roswell H.
 Stein, Mrs. Ilma B.
 Steinecke, Miss Jeannette A.
 Stellwagen, Fred L.
 Stevens, Mrs. Edward F.
 Stevenson, Charles G.
 Stewart, Miss E. Grace
 Stewart, Mrs. Seth Thayer
 Stewart Manor Garden Club
 Stobaugh, Miss Francis
 Stout, Mrs. Charles H.
 Straus, Hugh Grant
 Strong, Dr. L. V.
 Stutzer, Mrs. Herman
 Sullivan, Miss Bessie
 Swan, Mrs. J. L.
 Sweeney, Mrs. W. J.
 Switzer, Mrs. Frederick E.
 Sygoda, David F.
 Szerlip, Sidney
 Taber, Mrs. D. Shearman
 Talbot, Mrs. Henry D.
 Tanner, Mrs. Ernest K.
 Thacher, Mrs. A. B.
 Thatcher, Mrs. Edwin H.
 Thatcher, Mrs. John H.
 Thayer, Mrs. Gordon C.
 Thirkield, Mrs. Gilbert H.
 Thomen, Dr. August A.
 Thorndike, Miss Elsie
 Tiebout, Mrs. Ralph H.
 Tille, Samuel
 Tilley, Dr. R. McFarlane
 Tompkins, Miss Elizabeth M.
 Tousey, Miss Elizabeth
 Towl, Mrs. F. M.
 Traendley, Mrs. Frank H.
 Tredick, Miss Helen F.
 Trenchard, Henry
 Trismen, Frederick
 Turner, Mrs. Henry C.
 Tusch, Mrs. Walter
 Tuttle, Mrs. Winthrop M.
 Tyler, Mrs. Walter L.
 Tyrrell, Dr. G. W.
 Udkowsky, Bernard
 Ughetta, Miss Marye
 Uhdal, John H.
 Utter, Miss Eleanor

Vail, Harry C.	Weinberg, Henry
Valentine, Stephen	Weithas, Mrs. R. C.
Van Brunt, Jeremiah R.	Wells, Mrs. Walter F.
Van Sinderen, Mrs. Adrian	Wemyss, Frederick S.
Van Sinderen, Adrian	Wenzel, Fred.
Van Sinderen, Henry B.	White, Alain
Van Vleck, Miss Clara	Wikander, Miss Elin
Varin, Miss Dora N.	Wikle, Mrs. Herbert F.
Veatch, Mrs. A. C.	Willard, George N.
Vernon, Paul E.	Willetts, Mrs. W. P.
Von Lehn, Mrs. Richard	Williams, Mrs. E. F.
Vovodich, Miss Catherine	Williams, Mrs. John O.
Walcott, Mrs. Arthur S.	Williams, R. L.
Walder, Miss Selma	Williamson, Miss Marguerite Moli- ère
Waldes, Mrs. Ica	Wilson, Mrs. Christopher W.
*Walsh, James A.	Wilson, Mrs. Francis A.
Walton, Mrs. Henry R.	Wing, Miss Beulah A.
Wandel, Mrs. William S.	Wittmer, Mrs. Mary
Ward, Mrs. Charles L.	Wolfe, Mrs. Sophie K.
Ward, Mrs. Rodney C.	Wood, Mrs. Willis D.
Wark, Charles F.	Woodruff, Miss Helen G.
Warren, Mrs. Luther F.	Woodward, Miss Mary Blackburne
Warren, William H.	Young, J. Marshall
Watton, Mrs. W. F.	Zabriskie, Mrs. Elmer T.
Wayman, Robert	Zartmann, Wm. J.
Weber, Henry	Zellner, Mrs. Carl P.
Weber, Louis	Zimmele, Charles F.
Weck, Mrs. Edward	Zimmer, Mrs. Wilson Briggs
Weeth, Dr. Charles R.	

SUMMARY OF MEMBERSHIP

Benefactors	6	
Patrons	14	
Donors	26	
Permanent Members	71	
Life Members		
Through the Botanic Garden	21	
Through Other Departments	230	251
Sustaining Members		
Through the Botanic Garden	16	
Through Other Departments	38	54
Annual Members	677	
Total	1,099	

* Deceased.

BROOKLYN BOTANIC GARDEN RECORD

VOL. XXIII

JULY, 1934

NO. 3

REPORT ON WINTER INJURY TO THE WOODY PLANTS IN THE BROOKLYN BOTANIC GARDEN, 1933-1934

Doubtless such extreme cold periods as we experienced during the past winter have occurred intermittently since the beginnings of our present climate. It is obvious that they must be largely responsible for the northern limit of the range of our more tender native species. Not only this, but as the following report will show, extreme cold periods like that of the winter of 1933-34 determine what kinds of exotics can be grown successfully in our region. During ordinary years, a given species may survive the winters and continue to flourish from year to year. But the decisive factor is the extreme low temperature periods that occur at rare intervals. Then the more tender species may be entirely killed.

Extreme Weather Conditions in the Winter of 1933-34

There were two periods of extreme cold in the winter of 1933-34. The temperatures and amount of snow on the ground from day to day are shown in the following tables kindly supplied by the New York City Station of the United States Weather Bureau.

The first period (in December, 1933) was the less severe. Very probably if it had been the only one the plants would have suffered comparatively little. There are some features in it, however, which are distinctly dangerous. First, the drop from a maximum of 54° on Christmas Day (which, by the way, was the highest temperature for the whole month) to a minimum of 12° above zero on December 27th is rather sudden. To be felt by the plant as little as possible, a change in temperature should be

TABLE SHOWING TEMPERATURE AND SNOW COVER DURING EXTREME COLD PERIODS
IN WINTER OF 1933-34

Date	December, 1933					Date	February, 1934				
	Temperature (Degrees, Fahrenheit)			Snow (Inches)			Temperature (Degrees, Fahrenheit)			Snow (Inches)	
	Maximum	Minimum	Mean	Snowfall (midnight to midnight)	Depth of Snow on Ground at 8 p.m.		Maximum	Minimum	Mean	Snowfall (midnight to midnight)	Depth of Snow on Ground at 8 p.m.
M 25...	54	31	42	0	0	T 1...	35	30	32	9.6	6.5
T 26...	35	22	28	10.0	9.7	F 2...	31	11	21	0	9.0
W 27...	26	12	19	0	9.3	S 3...	23	4	14	0	8.4
T 28...	23	8	16	0	8.8	S 4...	27	15	21	0.1	7.1
F 29...	15	-3	6	0	8.6	M 5...	29	17	23	0	6.0
S 30...	14	-6	4	T*	8.5	T 6...	20	5	12	0	5.5
S 31...	42	12	27	0	6.6	W 7...	31	13	22	T*	5.0
						T 8...	21	-7	7	0	4.8
						F 9...	8	-14	-3	0	4.7
						S 10...	27	-2	12	0	4.3
						S 11...	33	12	22	0	3.4

* T = trace.

gradual. Many a plant has been killed by sudden freezing when it might endure without detriment much lower temperatures arrived at gradually. Another factor is, of course, the subzero temperatures (for a period of *two* days) which are fairly unusual for December in this region. How unusual they are is shown by the fact that subzero temperatures have been recorded in December only in four other years since and including 1871 (when records first began to be kept), namely in 1917, 13° below; 1880, 6° below; 1876, 2° below; and 1871, 1° below. This of course applies to the month of December only. Subzero temperatures in January and February in past years have been somewhat more frequent. January has had eleven days with subzero temperatures since and including 1871 and February eleven. (March has never had a subzero temperature since records began to be kept.) But it is probable that subzero temperatures in December are more harmful than those which come in January and February, for the

reason given above, that it is better for the plant to become gradually accustomed to the cold.

As regards the amount of snow on the ground in December, it will be seen from the table that ten inches fell on the 26th, which had melted to 6.6 inches by the 31st. The amount of snow cover during these cold spells is an important and decisive factor in the amount of winter injury sustained by low-growing plants such as the Heaths. Snow protects the parts that it covers both from extreme cold and from the drying effects of the winds. Furthermore, it protects the roots of the taller plants. Dr. Alfred Gunderesen, Curator of Plants at the Garden, tells us that in his native home in Norway each spring the low-growing woody plants were often found killed down to a definite line. This was the snow line.

In the case of the Swiss Heath (*Erica carnea*), which now for twelve years has done yeoman service through all the winter, often blooming on a warm day even in January, this blanket of snow probably saved its life. For we find that although the upper parts are killed, there are many sound shoots close to the ground.

The other extreme cold period, as shown in the table, was in February, 1934. The mercury on February 9 stood at -14° F.—the lowest that the weather bureau in New York City has ever recorded. But the figures we have reproduced for a few days in February do not tell the entire story, for the weather continued extremely cold throughout the month, with a minimum of 3° above zero on the 14th, 6° above on the 24th, 7° above on the 28th, and many other days on which the minimum was not far above these figures. The mean minimum for the whole month was 10.8° and the mean maximum 28.9° , as against a normal minimum of 24.2° and a normal maximum of 38.4° . It was an extremely cold month as a whole: on only ten days of the month did the temperature rise above the freezing point, and on only four days above 40° . As regards the snow cover, however, we were again fortunate, for during the coldest period, as shown in the table, there was a considerable blanket of snow on the ground. For a few days, namely, from the 12th to the 17th inclusive, this was reduced to from $2\frac{1}{2}$ inches to half an inch on the 18th; but snowfalls on the 19th, 20th, 25th, and 26th replenished the supply, so that at

the end of the month there was more than a foot of snow on the ground.

As regards the direction and velocity of the winds, these as a rule are not noteworthy, but a northwest wind with a velocity of fifty miles per hour on the 13th (minimum temperature 8°) and a velocity of fifty-one miles per hour on the 23d (minimum temperature 10°) must have made matters much worse.

Other Disastrous Winters in the History of the Garden

In connection with the present report it is interesting to compare the reports of Taylor on the effects of the winters of 1917-18 and 1919-20 on the woody plants in the Garden. Regarding the first period he says "Since weather records have been kept, there has been no such severe winter as the one just past. During the Christmas holidays, and just after, minimum temperatures were recorded of -13° at the Weather Bureau (414 ft. in the air), -10° at the New York Botanical Garden, -7° at the Central Park Weather Bureau station, which is nearly at ground level, and -8° at the Brooklyn Botanic Garden where the thermometer is in a somewhat sheltered place. The first four days of the year showed minimum temperatures of -5° , $+2^{\circ}$, 0° , and -3° respectively, and on January 12 the temperature was 50. Worst of all, on the latter day, the velocity of the wind was greater here than in any other place in the country, the record showing maximum velocity of 84 miles an hour, from the southeast. The following of such extreme cold by a warm wind of this great velocity apparently played havoc with many valuable plants in the Garden. With the ground frozen to depths unknown before, as there was practically no snow covering during the coldest days, the root activity of most plants would be stopped, while the warm wind on the 12th, when the maximum temperature for January was recorded, would dry out many evergreens even if they had withstood the cold of a few days before. Because of this combination of cold temperatures followed by warm wind, it is perhaps impossible to ascribe all our losses to cold alone. Certainly one or the other, or most probably their combination, has had disastrous results. . . ." ¹

¹ Taylor, Norman. Effects of the severe winter on the woody plants in the Garden. BROOKLYN BOT. GARD. RECORD 7: 83-84. 1918.

It is apparent that perhaps the worst feature of this period was the extremely violent (84 miles per hour) warm wind following directly after the cold period. This should be borne in mind in connection with what will be said later regarding the complexity of conditions causing winter injury.

In his report on injury due to the conditions in the winter of 1919-20, Taylor says; "While the winter of two years ago had several days when the temperature was lower than ever before recorded here, the past winter was more continuously cold than any other for thirty years. The notes on the effects of the past winter are, therefore, a record not so much of what one unprecedented period of low temperature will do, but rather the cumulative effect of two exceptionally bad winters, with only a single mild one intervening—that of 1918-1919."¹

In his first report (for the winter of 1917-18) Taylor divides the winter injuries into four categories.

- I. Killed outright.
- II. Killed to the ground but making new growth.
- III. Severely winter-killed, but now making recovery.
- IV. Only a little winter-killed.

For the sake of comparison with the same species or varieties in our present list, we have cited Taylor's findings wherever they apply, using the following symbols and adding the figures '17-18, thus:

- I = K: '17-18
- II = KG: '17-18
- III = SKR: '17-18
- IV = LK: '17-18

In his second report (for the winter of 1919-20) Taylor divides the winter injuries into three categories, as follows:

- I. Winter-killed.
- II. Severely winter-killed, but recovering.
- III. Slightly winter-killed.

In a similar way we have inserted these verdicts in our present report, using the following symbols:

¹ Taylor, Norman. Effects of the winter of 1919-1920 on the woody plants in the Garden. BROOKLYN BOT. GARD. RECORD 9: 121. 1920.

I = K: '19-20.

II = SKR: '19-20.

III = LK: '19-20.

It is hardly necessary to add that the total number of woody plants in the Garden at the time Taylor's reports were written was much smaller than it is today. Then the Garden was only seven and nine years old, respectively.

Perennial Plants

In a consideration of winter injury it is of course the perennial plants with which we are concerned, since they are the ones which have to live through the winter. Biennial plants, it is true, must also pass through one winter, but these are comparatively few in number, and include no woody species.

All perennial plants may be classified into herbaceous and woody species. The herbaceous kinds, *e.g.*, the peony, iris, and most kinds of lawn grasses, have no wood in their stems, and die down to the ground completely at the first "killing" frosts of winter, maintaining their existence throughout the winter in an underground stem or rhizome, a tuber, or a corm. These, then, are protected to a considerable extent during the winter period by a blanket of earth, and sometimes also by an additional covering of snow.

The woody perennials, on the other hand, whether they are shrubs such as the rose and the honeysuckle, or trees like the elm and the maple, drop their leaves at the approach of winter. Their woody stems, being exposed to the elements, have to resist death from cold if they are to retain the size to which they have grown. For if the part above ground is killed, they have to start all over again from basal shoots. Many of our shrubs, *e.g.*, many of the *Callicarpas*, the *Spiketails*, and the *Buddleias*, are having to do this now, and one might argue that no permanent injury has resulted. These plants, although woody, have simply been reduced to the somewhat anomalous position of membership in the class of herbaceous perennials. Still provided with vigorous roots, they can shoot up again with a rapid and extensive development of stem and leaves. In some regions, in fact, some of the *Buddleias* do

this as a regular thing, blossoming each year in midsummer. It is hardly necessary to add, however, that repeated injury like this cannot be for the best good of the plant. Further, the rank growth put forth by killed back individuals is the more sensitive to injury the succeeding winter.

Nature of Injury from Extreme Cold

Sachs long ago showed that under ordinary conditions, when plants are frozen, water passes out from the protoplasm and freezes in the intercellular spaces. When thawing occurs, the resultant water remains in the intercellular spaces until it is either evaporated or is reabsorbed by the cells which had released it, and which had become more or less plasmolyzed. In some cases it requires considerable time for the protoplasm to resume its normal condition and position and thus for the cell to regain its turgidity. Freezing in plants has been observed by Wiegand¹ to occur in the intercellular spaces. Water withdrawn from the cells forms ice crystals in these spaces. Excessive withdrawal of water from the cells of course results in considerable plasmolysis, and if this continues to an extreme point, death must ensue. It seems obvious that continued or extreme low temperatures would cause a continued removal of water from the cell, thus eventually causing the death of the cell itself.

Winter Injury the Result of a Complex of Conditions

Although we believe that the extreme low temperatures of the past winter were the fundamental cause of the injuries to our woody plants, yet it is evident, after careful observation of the different plants, that the matter is not really so simple as this.

No one can gainsay the fact that, given sufficiently low temperature, protoplasm will freeze, or at least become so altered chemically that it is no longer protoplasm, and hence no longer alive. Yet the physiological condition in which the plant finds itself at the onset of the cold period has much to do with its relative susceptibility and the extent of injury it sustains. This explains

¹Wiegand, K. M. The passage of water from the plant cell during freezing. *Plant World* 9: 107-118. 1906.

in part so many apparent discrepancies in hardiness in different individuals of the same species, and, furthermore, it accounts for different results in different winters. So much depends upon the amount of water present in the plant; the kind of growth it made the season before, whether vigorous or slight, early or late; whether or not it was pruned, and if so, how much, and when; whether or not it was exposed to drying winds or direct rays of the sun; whether or not it had been recently planted or moved, and so, how well it had become established in the soil—these are some of the things we may mention briefly to show how the physiological condition of individuals may vary. In addition, we should note that there is in all probability an inherent predispositional factor (residing in the protoplasm itself)—*i.e.* predisposing a given individual to injury from cold. This of course is bound up with the constitution of the protoplasm. If such predisposition exists in animals and ourselves (and there seems to be no doubt of this) it seems reasonable to assume that it occurs also in plants. The following paragraph deals with this conception from a genetic point of view.

Hereditary Nature of Hardiness

In an earlier number of this journal, Dr. Orland E. White, formerly Curator of Plant Breeding at the Garden, has stated that since hardiness in plants is an hereditary character, "its basis is dependent on the presence or absence of certain genes" or hereditary units in the nucleus of the plant cell. Since new genes (and thus new characters) may arise by mutation, it is conceivable, he says, that a given plant species may have among the individuals composing it some 'hardy' mutants. In other words, cold resistant varieties may perhaps arise within a plant species by mutation.¹

Reasons for Discrepancies in Data on Hardiness

Because of these individual differences; and because of the complexity of the factors whose interaction determines the degree of a plant's susceptibility to winter injury, any collection

¹ White, O. E. Geographical distribution and the cold-resisting character of certain herbaceous perennial and woody plant groups. *BROOKLYN BOT. GARD. RECORD* 15: 1-10. 1926.

of data on hardiness will of necessity show discrepancies. We may summarize the more important reasons for these discrepancies as follows:

I. Possibility of variation between individuals of the same species with respect to susceptibility to cold.

II. Site. Locations in the Garden vary as regards protection from cold, soil conditions, and exposure to wind and sun.

III. Extent to which plants have become established. Specimens set out within the last year or two may be more susceptible to injury than those whose roots are well established in the soil.

IV. Some individuals may have been predisposed to injury by attacks of insects, fungi, from drought, or other external factors.

V. Other causes for the variation in the physiological condition of individuals resulting in predisposition to injury from cold. (See paragraph above on "winter injury the result of a complex of conditions.")

VI. Size of individuals. It is possible that in some cases, larger individuals which have grown in a given location for a number of years, may be more cold resistant than smaller specimens—this, too, apart from the fact that their roots are doubtless better established in the soil.

For these reasons the data presented below can not be regarded as an absolute criterion of hardiness for any given species.

Explanation of Symbols Used in List

The families with indeterminate growth, such as the roses and honeysuckles, are of course especially susceptible. Where A has been inserted after these or any other species, the meaning is that even in spite of the injury the plant looks well, the new growth having hidden the dead shoots or shoot tips. It will be noted throughout the list that many species are included which were not injured. This winter was such a rigorous test that we think it advantageous to have at least a partial list of those that passed through the ordeal successfully.

Many of the "half hardy" plants, *e.g.*, *Magnolia grandiflora*, were protected from early December throughout the winter by a covering of burlap or lath screens. These plants are designated P. The symbols used to designate the data presented in Taylor's

reports have already been explained (pp. 175-176). Those plants which are in the nursery are marked N. Many of these are being tested there for hardiness under Brooklyn conditions.

The following Roman numerals are used to denote the character of the winter injury in 1933-34, and, in the cases of the last three, its extent.

- I. Entirely dead. (Roots and stems all killed.)
- II. Killed to base. (Roots apparently sound; new basal shoots showing.)
- III. Percentage of main shoots killed.
- IV. Percentage of branch tips killed.
- V. Evergreens: percentage of leaves killed.

GYMNOSPERMAE

Ginkgoaceae

Ginkgo biloba—*Uninjured*

Gnetaceae

Ephedra

distachya—S. Eu., N. Asia—IV 50% N
major var. *procera*—*Uninjured*

Pinaceae

Abies Nordmanniana—S.W. Eu., Asia Minor—Slight browning of tips of leaves. LK: '17-18; SKR: '19-20

Araucaria araucana—Chile—I N

Cedrus

atlantica—N. Afr.—IV slight—three specimens. Fair sized trees about 25 ft. high

deodara—Himalayas—I P

Libani—Asia Minor & Syria—Two specimens: one uninjured, not P; other killed back about $\frac{1}{2}$ way from tip of 2 main leaders. P; SKR: '17-18

Chamaecyparis

obtusa—Japan—A little injury on north side. K: '17-18
(*nana*) SKR: '17-18; LK: '17-18; K: '19-20

pisifera var. squarrosa—IV 50%. In rather bad condition
Uninjured: pisifera, pisifera var. aurea, pisifera var. filifera,
 pisifera var. plumosa

Cryptomeria japonica—China & Japan—IV slight. In good
 condition SKR: '17-18; LK: '17-18; SKR: '19-
 20

Cunninghamia lanceolata—S. & W. China—I N

Glyptostrobus pensilis—China—II N

Juniperus

chinensis—China & Japan—Some tips of branches
 browned; SKR: '19-20

communis—N. temp. & Arctic regions—Some of last
 year's leaves browned, but plant in good con-
 dition

scopulorum—Western U. S. & Can.—IV 50%. Looks
 sickly

Uninjured: chinensis (dwarf), chinensis var. Pfitzeriana,
 horizontalis, Sabina, squamata var. Meyeri; vir-
 giniana (SKR: '19-20)

Larix laricina and leptolepis—*Uninjured*

Picea

pungens—Colo. to N. Mex., Utah & Wyoming—V slight;
 SKR: '17-18; LK: '17-18; SKR: '19-20; LK:
 '19-20

Uninjured: omorika, orientalis; polita; SKR: '17-18;
 '19-20

Pinus

Cembra—Eu. & N. Asia—Some specimens show a little
 browning of old leaves at tips

densiflora—Japan—IV & V slight

excelsa—Himalayas—About 50% of old needles shed;
 those remaining, about 50% brown; branches un-
 injured; new needles healthy

koraiensis—Japan, Korea—Some specimens show a slight
 browning of tips of old leaves.

nigra—C. & S. Eu., Asia Minor—Many specimens: some
 browning of needles in a few cases. Seems to
 be best pine for N. Y. City conditions of summer
 and winter

Pinaster—Mediterr. Region—I N

ponderosa var. scopulorum—W. U. S.—Old leaves somewhat browned

pungens—N. J. to Ga.—Old leaves browned about half way

Strobus—Eastern N. A.—Old leaves a little browned at tips. In good condition

tabulaeformis (sinensis)—N. to W. China—one specimen V 100%; IV 40%. Many terminal buds seem injured. It may recover. One specimen V 50%; IV 50%

Thunbergiana—Japan—one specimen has leaves browned at tips. One specimen has lost nearly all its old leaves. Buds not injured. Two other specimens in bad shape (partly bud moth injury). Many of old leaves and some of branch tips killed: one six ft., one 12 ft. high.

Uninjured: Banksiana, Bungeana, densiflora var. umbra-culifera, flexilis, montana, monticola, parviflora, parviflora var glauca, ponderosa, rigida, sylvestris

Pseudolarix Kaempferi—E. China—*Uninjured*

Pseudotsuga Douglasii—B. C. & W. U. S.—*Uninjured*

Sequoia gigantea—Sierra Nevadas—One specimen I; other specimen (8 ft. high) badly killed on main stem and all branches, but many green shoots coming out from branches. SKR: '17-18 "nearly dead"
P

Taxodium distichum—*Uninjured*

Thuja

occidentalis and vars.—E. N. A.—a little browning in some cases

orientalis var. aurea—about half killed. Some specimens IV 20%

Uninjured: occidentalis and vars.; orientalis, orientalis var. asplenifolia, Standishii

Thujopsis dolabrata—Cent. Japan—IV 25% N

Tsuga

- caroliniana—Va. to Ga.—one specimen I; one specimen
IV slight and V 75%; 2 specimens *uninjured*
diversifolia—Japan—V slight
Sieboldii—Japan—IV 10%
Uninjured: canadensis; SKR: '17-18

Taxaceae

- Cephalotaxus drupacea—Japan—1 plant, 8 in. high, I; one
plant 18 in. high, *uninjured* N
Podocarpus macrophylla—Japan—I N
Taxus

- baccata var. repandens—IV slight
Uninjured: brevifolia, cuspidata

ANGIOSPERMAE

DICOTYLEDONES

*Aceraceae**Acer*

- Buergerianum—E. China, Japan—IV 100% A
campestre—Eu., W. Asia—IV 10% A
cappadocicum—Cauc. and W. Asia to Himalayas—IV
50% A
carpinifolium—Japan—III 25%; IV 25%
Davidi—C. China—III 75%—(Complicated by fungous
trouble; may die)
macrophyllum—Alaska to Calif.—IV 90%—Terminal
buds nearly all dead.
opalus—S. Eu.—IV 10%
palmatum—Korea, Japan—IV 100% A
ornatum—IV 100% A; LK: '19-20
Uninjured: ginnala, Negundo (K: '19-20), platanoides,
Pseudoplatanus, rubrum, saccharum
Dipteronia sinensis—China—*uninjured*—slight protection N

*Anacardiaceae**Rhus*

- canadensis—Eastern N. A.—IV 100% A
Cotinus—S. Eu. to Asia—IV 25%

javanica—China, Japan, Sandwich Is.—IV 100% A
 verniciflua—Japan, China, Himalayas—IV slight
Uninjured: Potanini, punjabensis sinica, sylvestris, Vernix

Annonaceae

Asimina triloba—*Uninjured*

Aquifoliaceae

Ilex

Aquifolium—Eu. and Asia—IV 100%—Shooting out below dead part. **K**: '17-18; **SKR**: '19-20 **P**
 balearica—7 plants averaging about 5 ft. high—II
 heterophylla—IV 75% ; V 90% ; A **P**
 cornuta—E. China—I **P**
 crenata—Japan—IV 30-50% ; V 15-50%—Varies much according to site
 Fargesii—W. China—IV 50% ; V 90% ; **KG**: '17-18; **SKR**: '19-20 **P**
 glabra—Mass. to Fla.—IV 10% ; V 5% A
 integra—Japan—I **P**
 latifolia—Japan—II—A few old basal shoots apparently sound; **KG**: '17-18 **P**
 opaca—N. A.—IV 5% ; V 50% ; **SKR**: '17-18
Uninjured: dubia (monticola), serrata, verticillata

Araliaceae

Acanthopanax

divaricatus—Japan—IV 90%—Occurs every year
 Henryi—C. China—IV 90% A
 pentaphyllus (Sieboldianus)—Japan—IV 10% A
Uninjured: ricinifolius

Aralia spinosa—*Uninjured*

Hedera helix—Eu. to Caucasus—V 40% ; IV 100%, but *uninjured* where protected under mat of branches

Aristolochiaceae

Aristolochia durior—E. U. S.—IV slight

*Berberidaceae**Berberis*

aggregata—W. China—One specimen IV 90% A—other specimen III 50%; IV 100%; **SKR**: '17-18

Prattii—IV 50%

aristata—N.W. Himalayas—IV 10% A; **LK**: '19-20

atrocarpa—W. China—I (recently planted)

chinensis—Caucas.—IV 30% A

dasystachya—C. & N.W. China—one specimen *uninjured*
—one specimen IV 50% A

Dielsiana—W. China—IV 10% A

Gagnepainii—W. China—IV 100%

ilicifolia—S. Chile—II

Julianae—C. China—IV 100%; **LK**: '19-20

Neuberti—(hort.)—IV slight A

Poiretii—N. China—IV 10% A; **SKR**: '19-20

polyantha—W. China—III 25%; IV 100% A

provincialis var. *serrata*—hort.—IV 75%

stenophylla var. *compacta*—hort.—II

thibetica—W. China—IV slight

Thunbergii—Japan—IV 25% A

atropurpurea—IV slight—In fine condition

minor—IV 90% A (in one site—elsewhere *uninjured*)

triacanthophora—C. China—III 90%

verruculosa—W. China—IV 90%

vulgaris x *Thunbergii*—IV 100% A

Wilsonae—W. China—Two specimens I; two specimens III 90%; **K**: '19-20; **SKR**: '19-20

Uninjured: *amurensis* var. *japonica*, *circumserrata*, *diaphana*, *Henryana*, *Thunbergii* var. *minor*, *Vernae*

Mahonia

Aquifolium—B.C. to Ore.—1 specimen *uninjured*; 1 specimen II; 1 specimen I; 4 specimens IV 100%; **KG**: '17-18; **SKR**: '19-20

Bealii—China—III 20%

pinnata—S.W. U. S. to Mex.—II

Nandina domestica—C. China to Japan—II N

*Betulaceae**Alnus*

glutinosa—Eu. & N. Asia—III 50%. 18 ft. high, several leaders, the tallest killed nearly to the base; many shoots from base. May be due to other causes

incana—Eu., Cauc., N. A.—IV 75%

rubra—Alaska to Calif., E. to Idaho—slight injury

Betula davurica, *Ermani*, *glandulosa*, *japonica szechuanica*, *papyrifera*, *pendula*, *pendula purpurea*, *pubescens*; all *uninjured*

Carpinus

Betulus var. *quercifolia*—(12 ft. high & 4 in. diam. at base). Upper 2/3 almost dead

Uninjured: *Betulus* (LK: '17-18), *yedoensis*

Corylus

americana—N. Eng. to Sask. and S. to Fla.—IV slight

columna—S. Eu., Himalayas—IV 25%

maxima purpurea—IV slight

Bignoniaceae

Bignonia chinensis—China—IV 100% A

Catalpa

bignonioides—S.E. U. S.—IV slight. Large tree

nana—IV 100%—Dormant buds of last year unfolding

ovata—China—IV 25%; LK: '17-18

Uninjured—*speciosa*—Large tree

*Buxaceae**Buxus*

sempervirens var. *suffruticosa*—Some specimens *uninjured*; some V 20%; some I; with various intermediate conditions—These were transplanted in fall 1933, which may have a bearing on their condition in spring 1934. P

Uninjured: *sempervirens*—K: '19-20; SKR: '19-20

Pachysandra procumbens, *terminalis*—*Uninjured*

*Calycanthaceae**Calycanthus*

floridus—Va. to Fla.—IV slight A—In fine condition;
KG: '17-18

occidentalis—Calif.—II. **KG:** '17-18; **LK:** '19-20

Meratia praecox—China—II N

*Caprifoliaceae**Abelia*

Graebneriana—China—I N

grandiflora—hort.—II P with chrysanthemum tops thrust
 among branches

Diervilla

rivularis—N. C. & Tenn. to Ga. & Ala.—IV slight; **SKR:**
 '19-20

sessilifolia—N. C. & Tenn. to Ga. & Ala.—IV slight; **K:**
 '19-20; **SKR:** '19-20

Dipelta floribunda—C. China—IV 100% A

Kolkwitzia amabilis—C. China—IV 100%—Flowers plentiful

Leycesteria formosa—Himal., S.W. China—I N

Lonicera

demissa—Japan—IV 10% A

Ferdinandi—N. China—IV 25%—Flowers abundant. Shrub
 16 in. in diameter at base, 12 ft. high with spread
 of 18 ft. Also small specimen IV 100% A

fragrantissima—E. China—IV 100% A—Some of the
 flower buds were injured so that the flowers were
 fewer and sometimes abortive

gracilipes—Japan—IV 30%

Henryi—W. China—Badly injured; **K:** '19-20

japonica Halliana—E. Asia—Badly injured

Korolkovii—Turkestan—IV 75% A

Maackii—Manch., Korea—IV 60%—But in very fine con-
 dition. Large shrub (2 specimens) one 12 ft.
 high with spread of 18 ft. Flowers plentiful

Periclymenum—Eu., N. Afr., Asia Minor—II

pileata—C. & W. China—II

prolifera—Wisc. to Tenn.—IV 50%

quinquelocularis var. translucens—Himalayas to Afghanist.

—III 25%; IV 100%

Ruprechtiana—Manch., & N. China—IV slight

Standishii—China—IV slight—Shrub 10 ft. high with
spread of 15 ft. Flowers plentiful

syringantha—N.W. China—IV slight

tatarica—S. Russia to Altai and Turkestan—IV 100% A—
also one specimen *uninjured*

Webbiana—S.E. Eu. to Himalayas—IV 40%—Some
leaves wilted after they came out

Xylosteoides—IV 25% A

Uninjured: chrysantha, chrysantha var. Regeliana, flava,
Maximowiczii, muendeniensis, Morrowii, muscaviensis,
Xylosteum

Sambucus

canadensis—E. N. A.

acutiloba—IV 100% A

nigra—Eu., N. Afr., W. Asia

albo-variegata—III 30%; IV 100%

pyramidalis—IV 100% A

Uninjured: canadensis

Symphoricarpos

albus (racemosus)—N. N. A.—IV 100% A

microphyllus—Mex.—IV 90% A

occidentalis—Central N. A.—IV 100% A; LK: '17-18

Heyeri—IV 100% A

orbiculatus—N. J. to Ga., Kans. and Tex., W. to S. Dak.

—IV 100% A; LK: '17-18

Viburnum *

affine—Que. to Ga.—IV 25% A

cotinifolium—Himalayas—III 50%

foetidum rectangulare—Asia—II N

ichangense—W. China—III 40%

nudum—L. I. to Fla. and La.—IV 75%

odoratissimum—S.E. Asia—I P

rhytidophyllum—W. China—II; LK: '17-18

rufidulum—S.E. U. S.—IV 50%

* In general, Viburnums that have been killed back will shoot up again from base.

Sargenti—N. China & Jap.—IV 50%—Not growing well
scabrellum—Pa. to Tex.—IV 10% A

theiferum—C. & W. China—IV 90% A; **LK**: '19-20

utile—C. China—1 plant I; 2 plants IV 100% N

Uninjured: acerifolium, burejaeticum, cassinoides (**K**: '17-18; **SKR**: '17-18), dilatatum, Lantana, Lentago, molle, Opulus, O. var. nana, prunifolium, tomentosum

Weigela

florida—N. China, Korea—IV 100% A—Flowers abundant

variegata—IV slight

hybrida—IV 50%—But abundance of flowers

Eva Rathke—IV 10% A

Uninjured: candidissima, japonica var. sinica

Celastraceae

Celastrus

angulata—China—II (2 upright shoots sprouting)

orbiculatus—China—IV slight A

Evonymus

Bungeana—China & Manch.—IV slight A

semipersistens—IV 100%. Looks unhealthy; shooting out along trunks; may have been winter-killed in trunks

hians—Japan—IV 25% A

japonica—S. Japan—I; **KG**: '17-18 P

nana—Eu. to W. Asia—III 50%; **LK**: '19-20

patens—China—IV 75% A

Uninjured: alata, alata var. compacta, europaea, verrucosa

Cercidiphyllaceae

Cercidiphyllum japonicum—Japan—IV slight A—In fine condition

Euptelea

Franchetii—C. China—IV slight A

polyandra—Japan—IV slight A

Cistaceae

Cistus laurifolius—Mediterr. region—I N

Helianthemum

(hort. forms)—III 50 to 100% P

nummularium var. *macranthum*—Eu., W. Asia—Some specimens I; others II 50% P

Compositae

Artemisia

austriaca—S.E. Eu.—III 50%

procera—S.E. Eu. & Asia Minor—III 50%

Baccharis halimifolia—Mass. to Tex.—III 25%; some II:

SKR: '17-18

Coriariaceae

Coriaria japonica—II; **KG:** '17-18

Cornaceae

Aukuba japonica—Himalayas to Japan—II P

Cornus (many species omitted)

kousa—Japan, Korea—IV 10%

macrophylla—Himalayas, China, Japan—IV 10%

paucinervis—C. China—III 50%

Uninjured: mas

Davidia involucrata—W. China—III 25%; IV 10%. Looks unhealthy. Shooting out from trunk as if cambium had been injured. Some of leaves curled. Tree 7 in. diam. at base; 15 ft. high

Helwingia japonica—China, Japan—IV 15%

Ebenaceae

Diospyros Lotus—Asia—II N

Elaeagnaceae

Elaeagnus angustifolia—*Uninjured*

Shepherdia argentea—Prairie States—IV 25%

Ericaceae

Arctostaphylos Uva-ursi—*Uninjured*

Calluna

vulgaris—N. Eu. & Asia Minor—I

alba—I 75% of plants

Clethra alnifolia (**SKR**: '17-18) and *barbinervis*: *Uninjured*

Enkianthus perulatus (**K**: '17-18; **SKR**: '17-18) and *campanulatus*: *Uninjured*

Erica carnea—C. & S. Eu.—I & II. New shoots from part protected by snow

Kalmia

angustifolia—E. U. S. & Can.—V 5%

latifolia—E. U. S. & Can.—III 5%; V 5%

Leucothoe

Catesbaei—S.E. U. S.—IV 25%; V 25%

racemosa—E. & S. U. S.—Flower buds almost entirely killed; **SKR**: '17-18

Pieris

floribunda—Va. to Ga.—IV 50%; **SKR**: '17-18

japonica—Japan—Flower buds almost entirely killed; **SKR**: '17-18

Rhododendron

(hort. forms)—V 25%; flower buds uninjured; some plants I

(hort. forms "Azalea")—IV 25%

carolinianum—N. C.—In poor condition previously; others *uninjured*

catawbiense—Va. to Ga.—IV and V slight A

maximum—N. S. & Ont. to Ga., La., & Ohio—IV and V slight A

Uninjured: *nudiflorum*, *viscosum*.

Eucommiaceae

Eucommia ulmoides—*Uninjured*; tree 16 in. at base; 18 ft. high; **LK**: '19-20

Euphorbiaceae

- * *Andrachne colchica*—Asia Minor—IV 100% A
- Daphniphyllum macropodum*—Japan, Korea, China—I N
- * *Securinega*
 - * *flueggeoides*—China & Japan—IV 100% A
 - * *ramiflora*—Asia—IV 100% A

*Fagaceae**Castanea*

- mollissima*—China & Korea—IV slight A
- sativa*—S. Eu., W. Asia. N. Afr.—II (Two-year seedlings in nursery)

Fagus

- orientalis*—Asia Minor to N. Persia—IV slight A
- Sieboldii*—Japan—IV slight
- Uninjured*: *sylvatica*, *sylvatica* vars. *atropunicea*, *Riversi*, *zlatia*

Quercus

- aliena* var. *acutiserrata*—IV slight
- hispanica* var. *lucombeana*—S. Eu.—Three individuals: 2, IV 90% ; 1, IV 100%
- Michauxii* (*Prinus*)—Del. to Tex.—IV 100% A
- phellos*—N. Y. to Tex.—Upper half dead
- Robur* var. *fastigiata*—IV 100%. Mostly back to 1932 growth
- undulata*—Colo. to Nev. & Tex.—IV 100% A
- Uninjured*: *alba*, *dentata*, *Gambelii*, *glandulifera*, *heterophylla*, *imbricaria*, *lyrata*, *macrocarpa*, *Robur*

Flacourtiaceae

- Idesia polycarpa*—S. Japan & C. & W. China—(staminate form)—Two specimens, both 7 in. diam. at base—I; (pistillate form)—Two specimens, one 8 in. diam. at base and 15 ft. high—IV 100%. Shooting out from buds near base of last year's (1932) growth. Many short branches dead, but

* These species (which are low shrubs) probably die back a little each year.

will recover. Other 6 in. diam. at base, 13 ft. high—III 25%; IV 100%. May recover, but very doubtful. Shooting out from sides of old branches.

Garryaceae

Garrya elliptica—Oreg. to Calif.—I N

Guttiferae

Hypericum densiflorum—N. J. to Fla., Mo. & Tex.—III 50%

Hamamelidaceae

Corylopsis

pauciflora—Japan—IV 50%; LK: '17-18; SKR: '19-20

spicata—Japan—IV 100% A

Fothergilla major—*Uninjured*

Hamamelis japonica, *vernalis*, & *virginiana*—*Uninjured*

Liquidambar styraciflua—*Uninjured*

Loropetalum chinense—China—I—(had survived winter 1932-1933) N

Parrotia persica—Persia—IV slight A. One tree 6-8 in. diam. at base & 25 ft. high; another shrubby specimen 12 ft. high. Both in fine condition. SKR: '19-20

Parrotiopsis Jacquemontiana—Himalayas—II—Tree 9 ft. high

Sinowilsonia Henryi—China—IV 100% N

Hippocastanaceae

Aesculus hippocastanum, *Baumanii*, *hybrida*, *parviflora*, *Pavia*, & *turbinata*—*Uninjured*

Juglandaceae

Platycarya strobilacea—China—III 50%; in nursery II

Pterocarya fraxinifolia—Cauc. to N. Persia—IV slight A (8 in. diam. at base and about 12 feet high)

Uninjured: *Carya* spp., *Juglans* spp.

Lardisabalaceae

Akebia quinata—China & Japan—IV 100% A

Decaisnea Fargesii—W. China—III 50%; IV 100% A

Lauraceae

Laurus nobilis—Mediterr. Region—II N

Leguminosae

Albizzia julibrissin—Persia to C. China—IV 100%. Very slow coming out

Amorpha

fruticosa—E. & S. U. S.—IV 100% A. Shoots killed back 4 or 5 in.

glabra—N. C. to Ala.—IV 15%

tennesseeensis—S. U. S.—Nearly dead, excepting a few buds on branches, and many shoots from base

Campylotropis macrocarpa—N. and C. China—I & II

Caragana ambigua, *arborescens*, *arborescens* var. *Lorbergii*, *Boisii*, *chamlagu*, *decorticans*, *frutex*, *grandiflora*, *Maximowicziana*, & *microphylla*—*Uninjured*

Cercis chinensis—C. China—IV slight A; **KG**: '17-18; **SKR**: '19-20

Cladrastis lutea—*Uninjured*

Colutea

orientalis—S.E. Eu. & Asia—I

istria—Asia Minor—IV 100% A

Coronilla Emerus—C. & S. Eu.—IV 100%; V 75%; at north side, II

Cytisus

hirsutus—S.E. Eu.—IV 100% A

praecox—hort.—one specimen III 50%; another II; others IV 50%. Individuals vary. North side most affected. **P**

scoparius—C. & S. Eu.—I

Genista hispanica—Spain to N. Italy—III 75% N

Gleditsia

aquatica—S. C. to Texas—IV 100%

caspica—Transcauc. to N. Persia—IV 100%

triacanthos—W. N. Y. to Tex.—IV 30% A. Tree 6 in.
diam. at base, 20 ft. high. LK: '17-18

Uninjured: japonica (horrida)

Gymnocladus dioica—N. Y. to Okla.—IV 100%. Slight dying back at tips of branches an ordinary occurrence each year

Laburnum Watereri—hort.—IV 100% A

Maackia amurensis—*Uninjured*

Robinia

Pseudoacacia—E. U. S.—IV slight A

Decaisneana—IV slight A

Rehderi—IV 20% A

Uninjured: fertilis, hispida, Pseudoacacia var. Bessoniana,
Pseudoacacia var. Holdtii

Sophora japonica—*Uninjured*

Ulex europaeus—C. & W. Eu.—II P

Wistaria, all spp.—IV 100% A

Leitneriaceae

Leitneria floridana (pist. form)—Fla. to Tex.—IV slight

Loganiaceae

Buddleia

albiflora (Hemsleyana)—China—II

Colvillei—Himal.—II

Uninjured: alternifolia

Lythraceae

Lagerstroemia indica—China—II N

Magnoliaceae

Kadsura japonica—Japan, Korea—II N

Magnolia

grandiflora—N. C. to Fla.—One specimen nearly dead;
one half dead; two others V 100% but buds uninjured. P

liliflora—China—IV 10%

Uninjured: macrophylla (small tree in sheltered site), parviflora, Soulangeana, stellata, tripetala

Malvaceae

Hibiscus syriacus—China, India—IV 80%

Meliaceae

Cedrela sinensis—China—Two specimens, one 20 ft. high, 10 in. diam. at base; other 30 ft. high, 16 in. diam. at base. Larger one more injured, but both in good condition June 24. One: IV 50%. New growth starting in most cases from dormant buds, often many years back (e.g. one 10 yrs. back); also from accessory buds at base of terminal bud. Other: IV 35%. New growth starting in many cases from dormant buds a few years back, but not so many terminal buds killed as in above.—Young tree in nursery, 6 ft. high. II

Menispermaceae

Cocculus carolinus—Va. & Ill. to Fla. & Tex.—IV 100% A.
K: '19-20

Menispermum

canadense—E. N. A.—IV slight

dahuricum—China & Japan—IV 100% A

Sinomenium acutum var. *cinerascens*—Japan & China—IV 100% A

Moraceae

Broussonetia papyrifera (pist. form)—China & Japan—about 2/3 dead; LK: '17-18

Broussonetia papyrifera (stam. form) China & Japan—about 9/10 dead. This specimen was blown over in Aug. 1933, which may account for greater winter injury

Ficus carica—W. Asia—II P

Maclura pomifera—Ark. to Okla. & Tex.—IV 100% A

Morus

acidosa—China & Japan—IV 100%

alba var. *tatarica*—Asia—IV slight

cathayana—C. and E. China—A weak specimen; only one branch living; **SKR**: '17-18

mongolica (stam. form)—China—IV 100%. In excellent condition

Uninjured: alba var. pendula

Myricaceae

Myrica caroliniensis—*Uninjured*

Oleaceae

Chionanthus

retusa—China—IV 10% A

virginica—Pa. to Fla. & Tex.—IV 100% A

Fontanesia

Fortunei—China—IV 100% A; **SKR**: '19-20

phillyreoides—W. Asia—IV 100% A

Forestiera

ligustrina—S.E. U. S.—IV 10%

neo-mexicana—S.W. U. S.—IV slight

Forsythia

intermedia spectabilis—30% of flower buds killed—IV 100%

Uninjured: suspensa Fortunei

Fraxinus excelsior—*uninjured*

Jasminum

fruticans—S. Eu., N. Afr.—I N

nudiflorum—China—IV 100%; **KG**: '17-18; **SKR**: '17-18; **SKR**: '19-20

Ligustrum

* ovalifolium—Japan—Young hedges IV slight. Older hedges II & III, in varying percentages. Frequent clipping during growing season seems to render this sp. more susceptible to winter injury.

sinense—China—almost entirely dead. **SKR**: '17-18

strongylophyllum—C. China—II P

* This privet and *L. vulgare* do not seem to be as much affected in the Garden as in the immediate vicinity.

vulgare—Eu., N. Afr.—IV slight
atrovirens—IV slight

Osmanthus

armatus—W. China—II N
ilicifolius—Japan—II P

Phillyrea decora—W. Asia—II N

Syringa

japonica—Japan—IV 90% A
persica—Persia to N.W. China—IV 90% A
tomentella—W. China—IV 100% A
villosa—N. China—III 75%. Many new shoots killed
but some in good condition and going to bloom
Uninjured: (hort. forms)

Plumbaginaceae

Ceratostigma Willmottianum—W. China—I N

Polygonaceae

Polygonum Aubertii—China—IV 100% A

Ranunculaceae

Clematis Vitalba—Eu., N. Afr., Cauc.—IV 50%
Other *Clematis* spp. killed back a little, but in good condition
Paeonia suffruticosa—N.W. China—IV 100%. Some killed
back considerably
Zanthorhiza apiifolia—N. Y. to Ky. & Fla.—IV 50% A

Rhamnaceae

Berchemia racemosa—Japan, Formosa—II P
Ceanothus americanus—Canada & E. & Cent. U. S.—III 75%
Hovenia dulcis—China—II P
Paliurus spina-Christi—S. Eu. and Asia—II N
Rhamnus
imeretina—Cauc., W. Asia—IV very slight
Uninjured: cathartica, Frangula
Zizyphus jujuba—S.E. Eu. to S. and E. Asia—IV 90% P

Rosaceae *

Exochorda

Korolkowii—Turkestan—IV 100% A

Uninjured: Giraldii

Kerria

japonica—E. Asia—IV 100% A

picta (variegated form)—IV 100% A

Physocarpus

glabratus—Colo.—About half dead

opulifolius—Que. to Va., Tenn. & Mich.—IV 25%. Some shoots died back long distance

Rhodotypos kerrioides—Japan, C. China—IV slight A. In fine condition

Rosa (Includes only species and vars. in systematic section)

alba—slight injury

Carter's Annual—III 50%

centifolia—E. Cauc. III 50%; LK: '19–20

Hugonis—C. China—IV 25%

rugosa—N. China, Korea, Japan—slight injury

Uninjured: californica, multiflora cathayensis

AMOUNT OF WINTER KILLING AMONG CLIMBING ROSES IN ROSE
GARDEN †

Albertine—III 50%

Alida Lovett—all old wood killed. Many well ripened young shoots alive

American Pillar—Much injured in exposed places

Auguste Roussel—*Uninjured*

Aviateur Blériot—III 70%

Baltimore Belle—*Uninjured*

Ben Stad—III 75%

Bess Lovett—III 75%. Still dying back (June 22d)

Blaze—III 70% P

Bloomfield Courage—III 50%. Sparse flowering

Bonnie Prince—*Uninjured*

* Many members of this family die back a little in ordinary winters.

† Data supplied by Mr. Montague Free, Horticulturist of the Brooklyn Botanic Garden.

- Breeze Hill—III 50%. Still dying back (June 22d)
 Carmine Pillar—III 50% P
 Chaplin's Pink Climber—*Uninjured*
 Christine Wright—*Uninjured*
 Cl. American Beauty—IV 100%
 Cl. Gruss an Teplitz—II
 Cl. Lady Ashtown—III 50 to 75%
 Cl. Los Angeles—II P
 Cl. Mme. Caroline Testout—III 75%
 Cl. Ophelia—I P
 Cl. Orleans—IV 100%. Still dying back (June 22d)
 Cl. Richmond—III 50% P
 Comtesse Prozor—I
 Coralie—III 75%
 Coronation—*Uninjured*
 Crimson Rambler—Laterals killed
 Dorothy Perkins—*Uninjured*
 Dr. Huey—Some shoots killed; poor blossoming
 Dr. W. Van Fleet—IV 100%. Much injured in exposed places
 Emile Fortépaule—Old wood and immature shoots killed. Rest
 uninjured
 Emily Gray—I & II
 Evangeline—*Uninjured*
 Excelsa—Some canes killed
 Félicité et Perpetué—IV 100% P
 Freifrau von Marschall—*Uninjured*
 Gardenia—III 75%
 Ghislaine de Feligonde—*Uninjured*
 Gloire de Dijon—III 50% P
 Hiawatha—*Uninjured*
 Hildenbrandseck—III 75%. Perhaps partly due to attack of
 scale insects in 1933
 Jacotte—III 90% P
 Lambertiana Roses—*Uninjured*
 Le Rêve—*Uninjured*
 Lessing—*Uninjured*
 Marietta Silva Tarouca—*Uninjured*

Mary Lovett—Some shoots alive near top; some killed to ground.

Older wood suffered most

Mary Wallace—III 50%

Max Graf—*Uninjured*

Mermaid—II P

Milky Way—*Uninjured*

Miss Flora Mitten—*Uninjured*

Mme. Auguste Nonin—*Uninjured*

Mme. Grégoire Staechelin—II

Multiflora cathayensis—*Uninjured*

New Dawn—IV 100%

Non plus ultra—IV 100%

Papa Gouchault—IV 100%. Bloomed well

Papa Rouillard—*Uninjured*

Paul Noël—Oldest canes killed

Paul's Scarlet Climber—Laterals dead, and some main shoots.

Fairly good bloom

Pemberton Roses—III 75%

Philadelphia—III 75%

Primevère (Primrose)—III 75%

Prosperity—Old canes killed

Reine Marie Henriette—III 40% P

Renée Danielle—III 70% P

Romeo—III 75%

Rosa rugosa repens alba—*Uninjured*

Rosella—II. Newly planted

Ruga—III 70%. Newly planted P

Schneelicht—*Uninjured*

Scorcher—II P in March

Silver Moon—III 50-75%

Star of Persia—*Uninjured*

Tausendschön—*Uninjured*

The Beacon—Half top growth killed P

Thelma—*Uninjured*

Veilchenblau—IV 100%

Wichuraiana—One shipment III 90%. Rest uninjured

Wichmoss—*Uninjured*

Zephirine Drouhin—III 75%

Rubus

adenophorus—C. China—III 50% A

alleghehiensis—N. S. to N. C. & Ark.—IV 100%

biflorus—Himalayas—IV 100% A

deliciosus—Colo.—IV 100% A

occidentalis—N. B. to Minn. and s. to Ga. & Colo.—III
75% A

odoratus—N. S. and N.E. U. S.—IV 100% A

phoenicolasius—N. China & Japan—III 50%; IV 100% A

Sorbaria

Aitchisonii—W. Asia—II

arborea var. glabrata—IV 100% A

assurgens—China?—IV 100%. Rather badly killed back

Lindleyana—Himalayas & China—II

sorbifolia—N. Asia from Ural to Japan—IV 100% A

stellipila—IV 100% A

Spiraea

albiflora—Japan—II

Billiardii—(S. Douglasii x S. salicifolia)—hort.—III 50%;
IV 100% half dead. **SKR**: '19-20

bumalda Anthony Waterer—hort.—IV 100% A; **LK**: '19-
20

cantoniensis—China, Japan—IV 15%. One very good
condition; another, IV 100%, about half dead;
SKR: '19-20

fl. pl.—III 50%; IV 100%. Half dead

chamaedryfolia—N.E. Asia—IV 100% A

crenata—S. Eu. & W. Asia—IV 75% not severe

fontenaysii—hort.—III 50%; IV 100%

rosea—IV 100% A

gemma—N.W. China—IV 100% A

Henryi—C. & W. China—One specimen IV slight A; an-
other III 50%, IV 100%, half dead; **K**: '19-20; **LK**:
'19-20

hypericifolia—S.E. Eu. to Sib.—IV 100% A

japonica atrosanguinea—Japan—IV 100% A

Margaritae—hort.—IV 100% A; **LK**: '19-20

- Menziesii—Alaska to Ore.—IV 100% A
 prunifolia var. plena—IV 100%. About half dead
 Sargentiana—W. China—IV 100% A
 superba—hort.—III 50% ; IV 100% ; half dead
 Thunbergii—Japan & China—IV 100% A (Injury slight)
 tomentosa—N. S. to Ga., w. to Man. & Kans.—IV 100% A
 Veitchii—China—IV 25% A
 Wilsonii—C. & W. China—IV 50% A
Uninjured: nipponica, Vanhouttei (in some sites IV 90% A)
 Stephanandra
 incisa—Japan and Korea—2 specimens about ½ dead;
 one specimen only slight injury

Rosaceae

(Pomoideae)

- Amelanchier spicata—*Uninjured*
 Aronia
 arbutifolia—Mass. to Fla., w. to Minn. and Tex.—IV
 slight. A sickly plant
Uninjured: melanocarpa var. elata
 Chaenomeles lagenaria, Maulei, Maulei var. alpina, sinensis—*Un-
 injured*
 Cotoneaster
 Dielsiana—C. China—IV 30% (another *uninjured*)
 Francheti—W. China—II
 horizontalis—China—one specimen half killed; one II;
 others *uninjured*
 microphylla—Himalayas—II
Uninjured: divaricata, foveolata, hupehensis, integerrima,
 lucida, nitens, racemiflora, racemiflora var. songarica,
 tomentosa, Zabeli
 Crataegus
 pedicellata—Pa. to Conn., N. Y. & Ont.—IV 50% A
Uninjured: arnoldiana, coccinioides, durobrivensis, Lavalley,
 Oxyacantha, phaenopyrum, pinnatifida, and others
 Cydonia oblonga—*Uninjured*
 Malus arnoldiana, atrosanguinea, baccata var. mandshurica, coro-

naria, floribunda, micromalus, prunifolia, prunifolia
var. fastigiata, pumila, pumila var. Niedzwetzkyana,
Scheideckeri, Sieboldii var. arborescens, sikkimensis,
Soulardi, theifera, toringoides—*Uninjured*

Mespilus germanica—*Uninjured*

Photinia

serrulata—China—II N

villosa—*Uninjured*

Pyracantha coccinea—Italy to W. Asia—II. Nine large specimens

Pyrus communis, *phaeocarpa* var. *globosa*, *ussuriensis*—*Uninjured*

Raphiolepis umbellata—S. Japan—I N

Sorbus Aucuparia, *intermedia*—*Uninjured*

Stranvaesia Davidiana—W. China—I N

Rosaceae

(*Prunoideae*)

Prinsepia sinensis, *uniflora*; **KG**: '17-18—*Uninjured*

Prunus

Armeniaca—W. Asia—IV slight

avium—Eu. & W. Asia—IV slight (large tree)

Conradinae—C. China—about half dead and shooting up from trunks and branches throughout. Tree shrubby, from a low trunk, 1½ ft. in diam. at base and 15 ft. high

Laurocerasus—S.E. Eu. & Asia Minor—2 specimens, I & II P

orthosepala—Kansas—IV slight

Persica (on *Kansuensis*) (var. "nectarine")—III 50%; IV 100%. About half dead; **K**: '17-18

nucipersica—(2 specimens)—IV 75% A (forming fruit)

pilosiuscula media—W. China—IV 25% A

pumila—N. Y. to Wis.—IV slight

umbellata—S. C. to Fla.—III 25%; another specimen *uninjured*

Uninjured: *americana*, *Besseyi*, *cerasifera*, *cerasifera* var.

Pissartii, domestica, hortulana, Maackii, maritima,
Maximowiczii, Padus, pseudocerasus, serrulata var.
fugenzo, Simonii, subhirtella, tomentosa, triloba,
utahensis

Rubiaceae

Cephalanthus occidentalis—N. Brunswick to Calif. and s.—IV
50% A

Rutaceae

Evodia

hupehensis—China—IV 25% A

Uninjured: Daniellii

Phellodendron

amurense—N. China, Manch.—IV slight

sachalinense—Sachalin I. to China—III 90%

Uninjured: chinense, japonicum

Poncirus trifoliata—N. China—3 specimens IV 50% A.
mostly lower branches; 1 specimen, large fruited.
I; K: '17-18; SKR: '17-18

Ptelea trifoliata (SKR: '17-18), trifoliata var. mollis—*Unin-
jured*

Skimmia japonica—Japan—one specimen I; one specimen II.
Planted in fall of 1933. P

Zanthoxylum

Bungei—China—7 in. diam. at base—II

piperitum—N.E. Asia—7 in. diam. at base—I

Uninjured: americanum

Salicaceae

Populus spp.: all *uninjured*

Salix spp. *uninjured*

purpurea—Eu.—IV 100% A; one specimen III 50%

Sapindaceae

Koelreuteria

apiculata—C. China—IV slight

paniculata—China, Korea, Japan—IV slight

Xanthoceras sorbifolia—*Uninjured*

*Saxifragaceae**Deutzia*

- Lemoinei*—hort.—IV 25% A
rosea var. *campanulata*—hort.—IV 100% A
scabra—Japan, China—II: another IV 25% A; **LK**: '17-18
 candidissima—II
Schneideriana var. *laxiflora*—C. China—II
Vilmorinae—hort.—II
Uninjured: *grandiflora*

Hydrangea

- arborescens* var. *sterilis*—IV 100% A
cinerea—S.E. U. S.—IV 30% A
macrophylla—Japan, Korea—II A P
 mandshurica—Manchuria, Japan—II A
paniculata—Japan & China—IV slight A
Uninjured: *Bretschneideri*, *paniculata* var. *grandiflora*, *quercifolia*

Itea virginiana—N. J. to Tex.—IV 100%; **SKR**: '17-18*Philadelphus*

- coronarius*—S.E. Eu. to Cauc.—IV 25% A; other specimens *uninjured*
grandiflorus—N. C. & Tenn. to Fla. & Ala.—IV slight A
incanus—W. China—IV 50% A
laxus—Ga.—IV 15% A.
Lemoinei—hort.—IV 50% A. In good condition; **LK**: '17-18
Lewisii—N.W. U. S.—IV 100%; severe; **LK**: '19-20
Magdalenae—W. China—IV 80%
nivalis—hort.—IV slight A
satsumanus—Japan—III 50%; IV 50%
Schrenkii var. *Jackii*—N. China & Korea—IV 100%.
 About half dead
verrucosus—hort.—IV slight A
virginalis—hort.—IV 75% A
Uninjured: *Falconeri*, *pubescens*

Ribes

- americanum*—N. S. to Va. and w.—II

- Culverwellii* (R. nigrum x *Grossularia*)—hort.—IV 75% A
divaricatum—B. C. to Calif.—IV slight
Gordonianum—hort.—IV 50% ; SKR: '19-20
Grossularia—Eu., N. Afr., Cauc.—IV slight A ; SKR:
 '19-20
leptanthum—S.W. U. S.—III 50%
odoratum—Cent. U. S.—IV 50% ; SKR: '19-20
petraeum—Mts. of W. & C. Eu.—IV 50% A
robustum—hort.—III 50% ; IV 100% A ; SKR: '19-20
sanguineum—B. C. to N. Calif.—II P
sativum var. *macrocarpum aureum*—IV 50% A
tenue—China & Himalayas—IV 25% (on north side)
Uninjured: *alpinum*, *curvatum*, *fasciculatum*, *luridum*, *niveum*,
ussuriense

Simaroubaceae

Ailanthus

- Giraldii*—W. China—IV slight—8 in. diam. at base, 25
 ft. high
Vilmoriniana—W. China—IV slight—25 ft. high, 1 ft. at
 base—Probably not more than usually happens
Picrasma quassioides—China & Japan—IV slight A

Solanaceae

- Lycium halimifolium*—S.E. Eu. to W. Asia—IV 90% A ;
 SKR: '19-20

Stachyuraceae

Stachyurus

- chinensis*—China—II
praecox—Japan—II ; LK: '17-18

Staphyleaceae

Staphylea

- bumalda*—Japan—IV 100%
colchica—Caucasus—IV 25%
Coulombieri—IV 50%
Uninjured: *pinnata*, *trifolia*

Sterculiaceae

Firmiana simplex—China & Japan—Branches killed, but much of trunk apparently sound and may shoot up later from base. (Tree 4 in. in diam. at base and 18 ft. high) P

Styracaceae

Halesia carolina—*Uninjured*; LK: '19-20

Symplocaceae

Symplocos paniculata—E. Asia—IV slight

Tamaricaceae

Tamarix

hispida—From east of Caspian Sea to Songaria—III 75%

odessana—Caspian region—III 50%; K: '19-20

parviflora—S.E. Eu.—III 90%

pentandra—S.E. Eu. to C. Asia—IV 75%

Theaceae

Gordonia Alatomaha—IV 100%—Only last year's growth killed—Dormant buds of 1932 shooting. P

Stewartia pentagyna—*Uninjured*; P

Thymelacaceae

Daphne

caucasica—Cauc.—I N

genkwa—China—I & II P

Mezereum—Eu. to Caucasus—IV slight

Dirca palustris—*Uninjured*

Tiliaceae

Tilia

euchlora—hort.—IV 10%

Uninjured: *cordata*, *Moltkei*, *neglecta*, *tomentosa*, *vulgaris*

*Ulmaceae**Celtis*

rugosa (Douglasii)—W. U. S.—IV slight

Uninjured: *sinensis*

Ulmus

foliacea var. *suberosa*—IV slight

Uninjured: *foliacea* var. *Koopmannii*, *glabra* var. *Camperdownii*, *parvifolia*, *procera*, *pumila*

Zelkova

Verschaffeltii—IV 50% A

Uninjured: *serrata*, *ulmoides* (*carpinifolia*)

*Verbenaceae**Callicarpa*

Giraldiana—China—II

japonica—Japan—Two specimens II; one smaller specimen 6 ft. high—IV 100% A

Caryopteris incana—E. China & Japan—II P (I in nursery)

Clerodendron trichotomum—E. China & Japan—II 75%—
Small shoots coming up in a radius of 4 ft. from
plant SKR: '17-18

Vitex

Agnus-castus—S. Eu. & W. Asia—II; KG: '17-18; LK:
'19-20

alba—II

Negundo incisa—N. China & Mongolia—II

ARTHUR HARMOUNT GRAVES
Curator of Public Instruction

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PROSPECTUS: 1934-35

I. COOPERATION WITH LOCAL SCHOOLS

The Brooklyn Botanic Garden aims to cooperate in every practicable way with the public and private schools of Greater New York in all matters pertaining to the study of plants and closely related subjects. The purpose of the Garden in this connection is to supplement and enrich the school work in the way of instruction, demonstration methods, study material, etc., which otherwise would not be available.

Geography classes, as well as classes in nature study and botany, find the collection of useful plants in the economic plant house, the Local Flora Section, and also the Japanese Garden, the Meridian Panel, the Armillary Sphere, and the Labelled Boulders, valuable adjuncts to their class work. Arrangements may be made by teachers of geography to have their classes study these collections under guidance. Illustrated lectures for geography classes may also be arranged for at the Garden.

To visiting college classes in geology and physiography the Botanic Garden offers interesting material for a study of glaciation. Notable features are a portion of the Harbor Hill terminal moraine (Boulder Hill), the morainal pond (the "Lake"), the labelled glacial boulders, and the Flatbush outwash plain. See Guide No. 7, "*The Story of our Boulders: Glacial Geology of the Brooklyn Botanic Garden.*" See also pages 239-241 for statements concerning the Labelled Glacial Boulders, the Meridian Panel, and the Armillary Sphere.

A. Talks at Elementary Schools.—The principals of public or private schools may arrange to have talks given at the schools

on various topics related to nature study, such as garden work with children, tree planting, the conservation of wild flowers, and Arbor Day. If an illustrated lecture is desired, the lantern and operator must be provided by the school, but slides will be furnished by the Botanic Garden. Address the *Curator of Elementary Instruction* for a list of talks and for appointments.

B. Talks at Secondary Schools and Colleges.—Informal talks on various subjects of an advanced botanical nature have been given for many years at Secondary Schools and Colleges by members of the staff. Arrangements for such talks should be made with the *Curator of Public Instruction*.

C. School Classes at the Garden.—(a) Public or private schools may arrange for classes, accompanied by their teachers, to come to the Botanic Garden for illustrated lectures either by the teacher or by a member of the Garden Staff.

(b) Notice of such a visit should be sent at least *one week* previous to the date on which a talk is desired. Blank forms are provided by the Garden for this purpose. These talks will be illustrated by lantern slides, and by the conservatory collection of useful plants from the tropics and subtropics. Fall and spring announcements of topics will be issued during 1934-35.

(c) The Garden equipment, including plant material, lecture rooms, lantern, and slides, is at the disposal of teachers who desire to instruct their own classes at the Garden. Arrangements must be made in advance so that such work will not conflict with other classes and lectures. For High School and College classes address the *Curator of Public Instruction*. For Junior High and Elementary School classes address the *Curator of Elementary Instruction*.

(d) The principal of any elementary or high school in Brooklyn may arrange also for a series of six lessons on plant culture to be given to a class during the fall or spring. A small fee is charged to cover the cost of the materials used. The plants raised become the property of the pupils. The lessons will be worked out for the most part in the greenhouse, and the class must be accompanied by its teacher. This is adapted for pupils above the third grade.

D. Seeds for School and Home Planting.—Penny packets of seeds are put up by the Botanic Garden for children's use. In

1934 more than 840,000 packets were distributed. In the early spring, lists of these seeds, order blanks for teachers and pupils, and other information may be secured on application to the *Curator of Elementary Instruction*.

E. Conferences.—Conferences may be arranged by teachers and principals for the discussion of problems in connection with gardening and nature study. Appointments must be made in advance. Address the *Curator of Elementary Instruction*.

F. Study and Loan Material.—To the extent of its facilities, the Botanic Garden will provide, on request, various plants and plant parts for study; also certain protozoa and sterilized nutrient agar. When containers are necessary, as in the case of agar, algae, and protozoa, they must be furnished by the school.

In the past, the Garden offered this service gratis, but both on account of the increasing demand and because of the decrease in appropriations, it has become necessary to make a small charge for the material supplied or loaned. This charge will be made only for material furnished to junior high schools, high schools, and colleges. As far as possible, material will continue to be supplied gratis to elementary schools in case one or more of their teachers are members of regular Botanic Garden classes. A Price List of the various materials furnished will be mailed on request.

Requests for material should be made by mail or telephone (Prospect 9-6173), at least a day in advance, to Miss Julia E. Best, School Service Assistant. Elementary school material should be called for at the Information Booth on the ground floor; high school and college material at Room 327.

MATERIAL USUALLY AVAILABLE

1. Algae:

Pleurococcus

Spirogyra

Vaucheria

Desmids

Blue-green algae: Oscillatoria and others.

2. Fungi:

Forms of fungi and lichens.

Plus and minus strains of bread mold.

Smut of oats or wheat.

Black stem rust of wheat.

3. Liverworts: *Conocephalum* and *Lunularia*.

4. Moss plants: protonema, "felt," and capsules.

5. Ferns:

Prothallia: for these a covered Petri dish or tin box should be sent.

Fronds with spores.

6. *Selaginella* with sporophylls.

7. *Elodea*—to show movement of protoplasm.

8. Corn or sorghum stems, dried.

9. Twigs to show opposite and alternate arrangement of buds.

10. Simple and compound leaves.

11. Various seeds and fruits to illustrate methods of dispersal.

12. Material for the study of genetics:

Pods of Jimson weed showing inheritance of smooth and spiny pods.

Sorghum seeds for demonstrating inheritance of red seedling color.

Pea seeds to show Mendelian seed and seedling characters.

13. Sensitive plants (*Mimosa pudica*).

14. Protozoa: *Paramecium*, *Euglena*, and others.

15. Fruit flies (*Drosophila*), wild type and mutants, transferred to bottles of culture medium supplied by applicant.

Specimens Loaned for Exhibit.

16. Leguminous roots with tubercles.

17. Riker mounts of powdery mildew, rusts and smuts, maple tar spot.

18. Riker mounts of peas showing inheritance of seed characters.

19. Oats showing inheritance of hull color.

20. Corn showing inheritance of endosperm colors.

21. Sorghum varieties and the F_1 hybrid.

22. Types of cereals: wheat, oats, barley, rye, rice, corn.

23. Eight types of wheat.

24. Eight types of barley.

25. Riker mounts of types of modified leaves.

26. Geranium, Coleus, Tradescantia—variegated green and white, for photosynthesis experiment.

Sterilized Agar

27. Petri dishes sent in *clean and dry* ten days in advance, or test tubes or flasks sent in one week in advance, will be filled with sterilized nutrient agar for the study of bacteria and molds.

G. Demonstration Experiments.—Teachers may arrange to have various physiological experiments or demonstrations conducted at the Garden for the benefit of their classes. Communications in regard to these matters should be addressed to the *Curator of Public Instruction*.

H. Loan Sets of Lantern Slides.—Sets of lantern slides have been prepared for loan to the schools. Each set is accompanied by a short lecture text of explanatory nature. In all cases these sets must be called for by a responsible school messenger and returned promptly in good condition. Address, by mail or telephone, Mr. Frank Stoll. The subjects now available are as follows. Other sets are in preparation.

- | | |
|------------------------|----------------------------------|
| 1. Plant Life | 4. Fall Wild Flowers |
| 2. Spring Wild Flowers | 5. Forestry |
| 3. Common Trees | 6. Conservation of Native Plants |

II. BUREAU OF PUBLIC INFORMATION

Consultation and advice, and the facilities of the library and herbarium are freely at the service of members * of the Botanic Garden and (to a limited extent) of others with special problems relating to plants or plant products, especially in the following subjects:

1. Plant diseases and determination of fungi.
2. Plant geography and ecology.
3. Determination (naming) of flowering plants.
4. The growing of cultivated plants and their arrangement; also their adaptation to soils, climate, and other factors.
5. The care of trees, shrubs, and lawns, and general gardening problems.

* For information as to membership consult pages v-vii of this PROSPECTUS.

Inquiries should be directed to the *Curator of Public Instruction*, preferably by letter.

Determination of Specimens.—If the identification of plants is desired, the material submitted should include flowers, and fruit when obtainable. Identification of a single leaf is often impossible. For identification of plant diseases, representative portions of the part diseased should be sent.

III. DOCENTRY

To assist members and others in studying the collections the services of a docent may be obtained. Arrangements should be made by application to the *Curator of Public Instruction* one week in advance. No parties of less than six adults will be conducted. This service is free of charge to members; to others there is a charge of 50 cents per person. For information concerning membership in the Botanic Garden see pages v–vii of this PROSPECTUS.

IV. COURSES OF INSTRUCTION

Except courses A23 and A29, each of the courses here announced is a unit and not a series of unrelated lectures. Students must enroll for an *entire course*. With the exceptions noted, no registrations will be made for separate class exercises.

Courses of instruction are offered in Botany, Horticulture, and Nature Study, and are divided into four classes:

- A. For members and the general public ("A" courses, p. 217)
- B. For teachers ("B" courses, p. 221)
- C. For children ("C" courses, p. 225)
- D. Other courses of a special nature ("D" courses, p. 227)
- E. Research courses ("E" courses, p. 227)

No course will be given when less than ten persons apply for registration. Since registration in many of the courses is restricted to a fixed number on account of the limited space available in the greenhouses, and for other reasons, those desiring to attend are urged to send in their application for enrollment and the entrance fee to the Secretary, Brooklyn Botanic Garden, several days in advance of the first exercise. This avoids delay at the beginning of the first exercise, ensures a place in the course, and enables the instructor to provide adequate material for the class.

Persons are requested not to register in any course, unless they are reasonably confident that they can attend the sessions of the class regularly and throughout. This is specially important where the number to be enrolled is limited. To register and not attend will quite certainly deprive someone else of the privilege of attending.

The following equipment is available for the courses :

1. Three *Classrooms* (in addition to the Boys' and Girls' Club Room in the Laboratory Building), equipped with stereoscopes and views, a stereopticon, plant collections, economic exhibits, models, and other apparatus and materials for instruction.

2. Two *Laboratory Rooms*, with the usual equipment for plant study.

3. Three *Instructional Greenhouses*, for the use of juvenile as well as adult classes, for instruction in plant propagation and related subjects.

4. *The Children's Garden*, on a piece of land about three-quarters of an acre in extent, in the southeast part of the Botanic Garden, divided into about 150 plots which are used throughout the season for practical individual instruction in gardening.

5. *The Children's Building*, near the north end of this plot, containing rooms for conferences and for the storage of tools, seeds, notebooks, special collections, etc.

6. *The Auditorium*, on the ground floor, capable of seating 570 persons, and equipped with a motion-picture machine and stereopticon, and electric current, gas, and running water for experiments connected with lectures.

In addition to these accommodations, the dried plant specimens in the herbarium, the living plants in the conservatories and plantations, and the various types of gardens, are readily accessible; while the main library and children's library, which contain a comprehensive collection of books on every phase of gardening and plant life, may be consulted freely at any time. See also pages 232-241.

A. Courses for Members and the General Public

Although the following courses are designed especially for Members of the Botanic Garden, they are open (unless otherwise specified) to any one who has a general interest in plants. Teach-

ers are welcome. Starred courses (*) are open also for credit to students of Long Island University, and are described in the current Long Island University catalog. Unless otherwise specified, all "A" courses are *free to members*: † of others a fee is required, as indicated. In courses where plants are raised, these become the property of the class members.

A13. Flowering Plants and Ferns of the New York Region: Fall Course.—Four sessions. Field identification of the common native and introduced plants of woodlands and roadsides, including identification of seeds and fruits. *Fee \$2. Saturdays, 2:30 p.m., September 29 to October 27. (Omitting October 13.)*

Miss Rusk.

***A33. Plant Families: Fall Course.**—Ten outdoor sessions in the Botanic Garden, for a study of the principal groups of plants and their relation to animals. Fall flowers and fruits, the main steps of plant evolution, and the interdependence of plant and animal evolution are considered. (*Not offered in 1934.*)

Dr. Gundersen.

***A5. Trees and Shrubs of Greater New York: Fall Course.**—Ten outdoor lessons in the parks and woodlands of Greater New York on the characteristics of our common trees and shrubs, both native and cultivated, emphasizing their distinguishing features in the winter condition. *Fee, \$5. Saturdays, 2:30 p.m., September 29 to December 15. (Omitting October 13 and December 1.)* The first session will be held at the Brooklyn Botanic Garden.

Dr. Graves and Miss Vilkomerson.

***A31. Ornamental Shrubs: Fall Course.**—Ten sessions, about eight of which are held outdoors in the Brooklyn Botanic Garden, for the purpose of becoming acquainted with the common species and varieties of cultivated shrubs. Fall flowers and fruits of ornamental shrubs and small trees, also evergreen shrubs, are studied. This is a continuation of the spring course. *Each division limited to 25 members, enrolled in order of application. Fee, \$5. Wednesdays: Division I, 10:30–11:45 a.m.; Division II, 4:15–5:30 p.m., October 3 to December 12. (Omitting November 28).*

Dr. Gundersen.

* Accepted for credit in Long Island University.

† For information concerning membership in the Brooklyn Botanic Garden consult pages v–vii.

A1. Plants in the Home: How to Grow Them.—Five talks with demonstrations. This course deals with the principles to be followed in raising plants. Practice in potting mixing soils, making cuttings, etc. The members of the class have the privilege of keeping the plants they have raised. *On account of restricted space in the greenhouse, this class must be limited to 40. Registration according to the order of application. Fee to non-members, \$6 (including laboratory fee); to members, \$1 laboratory fee. Wednesdays, 11 a.m., November 7 to December 12. (Omitting November 28.)* Mr. Free.

A20. Advanced Course in Gardening.—Ten lessons. This course presupposes a knowledge of the elements of gardening equivalent to that contained in courses A1 and A25. It consists of lectures illustrated with lantern slides and living material, and includes frequent tours in the Brooklyn Botanic Garden where the various types of gardens and other subjects of the lectures are demonstrated. *(Not offered in 1934.)* Mr. Free and Dr. Reed.

A23. Flower Arrangement.—Sponsored by the Woman's Auxiliary. Five talks, with demonstrations, on the principles of effective flower arrangement. The topics will include the principles of design applied to the arrangement of flowers; types and periods of flower arrangement; the use of color; the Japanese principles of flower arrangement, with application to Western uses; discussion and judging of individual arrangements submitted by members of the class. The guest speakers are prominent authorities on the subjects of design and artistic flower arrangement. *Fee to non-members, \$6. Single lectures, \$1.25. Tuesdays, 11 a.m. January 8 to February 5.*

A29. Practical Gardening.—A Saturday afternoon course for men and women. Five talks with demonstrations. Subjects discussed are: Soil management; planting; pruning; combatting plant pests; plant propagation, including budding and grafting. At the close of each session the class will be afforded an opportunity to bring up special garden problems for discussion. *Fee, \$4; single lecture, \$1. Saturdays, 3 p.m., February 2 to March 9. (Omitting February 23.)* Mr. Free.

A34. The History of Plant and Animal Classification.—A discussion of man's changing concepts regarding the grouping and

relationships of living things. Three illustrated lectures, dealing chiefly with the higher plants and animals (seed-bearing plants and vertebrate animals).

1. The Ancients and the Middle Ages: Economic and Miscellaneous Classifications.
2. From the Discovery of America to the French Revolution: the Idea of Organic Affinity.
3. From the Nineteenth Century to the Present: the Idea of Evolution, and the Growth of its Influence on Plant and Animal Classification.

Fee, \$2. Thursdays, 4 p.m., March 7 to March 21.

Dr. Gundersen.

A25. Fundamentals of Gardening.—A course in first principles, for those who desire to carry on practical work in their own gardens and to start seedlings in the greenhouse. The lessons are as follows:

Making cuttings of plants for use in the outdoor garden.

Planting seed in the greenhouse.

Planning the garden.

Pricking out seedlings in the greenhouse.

The garden soil.

Outdoor lesson.

Class limited to 60 members. Fee to non-members, \$7 (including laboratory fee); to members, \$2 laboratory fee. Wednesdays, 11 a.m., March 27 to May 1.

Miss Shaw and Miss Dorward.

A35. Greenhouse Gardening.—A course for those who have taken Fundamentals of Gardening, and who desire to work in the greenhouse with the newer varieties of perennials and other materials. The lessons are as follows:

Making cuttings of bedding and perennial plants.

Planting of seed (choice seed of 1934-35 novelties).

Planting seed of rock garden material.

Pricking out seedlings.

Pricking out rock garden seedlings.

Class limited to 40 members. Fee to non-members, \$10; to members, \$5 laboratory fee. Tuesdays, 10:30 a.m., April 9 to May 7.

Miss Shaw, Mr. Free, and Miss Dorward.

(Mr. Free will conduct the lesson on the starting of rock garden plants from seed.)

***A32. Plant Families: Spring Course.**—Ten outdoor sessions in the Brooklyn Botanic Garden. This course treats of the structure and possible lines of evolution of flowers, and the characteristics of important families of flowering plants, such as the Magnolia, Buttercup, Rose, Pea, Mustard, Pink, Geranium, Mallow, Carrot, Heath, Potato, Figwort, Mint, Honeysuckle, Composite, and Lily Families. Two divisions. *Each division limited to 25 members, enrolled in the order of application. Fee, \$5. Wednesdays: Division I. 10:30–11:45 a.m.; Division II, 4:15–5:30 p.m., April 10 to June 12.* Dr. Gundersen.

***A30. Ornamental Shrubs: Spring Course.**—Ten outdoor sessions held on the grounds of the Brooklyn Botanic Garden, dealing with the shrubs used in ornamental planting. More than two hundred species and varieties of shrubs are studied at the time of flowering. (*Not offered in 1935.*) Dr. Gundersen.

***A9. Trees and Shrubs of Greater New York: Spring Course.**—Ten outdoor lessons in the parks and woodlands of Greater New York, the principal object being to gain a ready acquaintance with the common trees and shrubs of the eastern United States, which are well represented in this region. The species are considered in systematic order, and the features emphasized by which they may most easily be recognized. *Fee, \$5. Saturdays, 2:30 p.m., April 13 to June 15. (Omitting April 20.)* Dr. Graves and Miss Vilkomerson.

A11. Flowering Plants and Ferns of the New York Region: Spring Course.—Six sessions, in the Brooklyn Botanic Garden and in the woodlands near the City, for field identification of spring flowers and ferns. *Fee, \$3. Saturdays, 2:30 p.m., April 27 to June 1.* Miss Rusk.

B. Courses for Teachers: Given in Cooperation with the Brooklyn Teachers Association

These courses have been accepted by the Brooklyn Teachers Association, and appear in its Syllabus of Courses. On satisfactory completion of each course, the student is awarded a certificate by the Brooklyn Teachers Association, in cooperation with the Brooklyn Botanic Garden. The courses are also accepted by the New York Board of Education for credit toward higher teaching li-

censes, one credit being granted for each 15 hours (with the exception of "B8, Plant Culture"). Through an agreement made in January, 1931, with Long Island University, undergraduate credit for certain courses will be allowed toward fulfilling the requirements for a university degree, provided the admission requirements at the University and the laboratory requirements have been fulfilled. Such courses are starred. By arrangement with the institution concerned, these credits may also be used as undergraduate credits in other colleges and universities. Nature materials used in the courses, and plants raised become the property of the student.

Members of the Garden are entitled to a 50 per cent. discount from the regular fee for all "B" courses; from other persons the indicated fee is required. Long Island University students desirous of electing any of these or of the "A" courses should notify Dean Tristram W. Metcalfe or Dr. Ralph H. Cheney, who will give the candidate a card entitling him to admission to the course. The student should present this card at the beginning of the first session of the course. *No course will be given when less than ten persons apply.*

***B1. General Botany.**—A two-year course of thirty class meetings each year. Also thirty two-hour laboratory periods, the time for the latter to be arranged when the class is organized. The first year (A) is spent on the structure and functions of the higher plants. Four credits. The second year (B) deals with the lower groups, their structure, life histories, and relationships. Four credits. In 1934-35 the first half of the course (A) will be given. The first half is not a prerequisite for the second, but those who have never studied botany before are advised to take (A) first. *Fee, \$10 each year. Thursdays, 4 p.m., beginning September 27.* Miss Rusk.

***B10. Flowering Plants: Field and Laboratory Study.**—Thirty sessions. The object of this course is to become acquainted with the species of wild flowering plants (native plants and introduced weeds), and to learn how to identify them. Field and laboratory work are distributed according to the weather, the season, and the needs of the class. The field work is done largely in the Brooklyn Botanic Garden. The laboratory work consists of ex-

* Accepted for credit in Long Island University.

amining flowering plants and identifying them by means of a key. Prerequisite: an elementary course in botany. Two credits. Fee, \$10. Wednesdays, 4 p.m., beginning September 26. Miss Rusk.

***B11-12. Structural Botany of the Higher Plants.**—Thirty three-hour sessions (one lecture, one two-hour laboratory period). This course is designed to employ the special facilities of the Brooklyn Botanic Garden. It deals chiefly with gross morphology and variation of leaves, stems, and fruits, and a systematic study of the flowering plants. It utilizes the living material in the conservatories. Of special importance is a written report, comprising an investigation of living plants and a study of references in the library. The topic for this report will be selected from the following:

1. Development of perforated leaves in *Monstera*.
2. Vivipary in ferns and flowering plants.
3. Comparison of the succulent plants of South Africa and America.
4. Comparison of flowers in various species and hybrids of *Citrus*.
5. A comparison of structure in several species of orchids.
6. A study of cladophylls and phyllocladia.
7. A study of the leaves and stinging hairs of *Laportea moroides*.
8. Growth and fruit production in the banana.
9. Variation in shape and coloring in leaves of croton (*Codiaeum*).
10. Types of pollen in greenhouse plants.
11. Morphological variation in spines and prickles.
12. Structure of a species of greenhouse plant.
13. Structure of insectivorous plants.

Four credits. Prerequisite, General Botany (B1) or its equivalent. Fee, \$10. Saturdays, 9 to 12 a.m., beginning September 29.

Dr. Svenson and Miss Rusk.

***B13-14. Trees and Shrubs of Greater New York.**—Twenty two-hour sessions. A course of outdoor lessons in the parks and woodlands of Greater New York, the principal object being to gain a ready acquaintance with the common trees and shrubs of the eastern United States, which are well represented in this region.

The species are considered in systematic order, in both winter and summer conditions, and the features pointed out by which they may most easily be recognized. Two credits. *Fee*, \$10. *Saturdays*, 2:30 p.m., *September 29 to December 15*; and *April 13 to June 15*. (Omitting *October 13, December 1, and April 20*.)

Dr. Graves and Miss Vilkomerson.

***B15-16. Economic Plants.**—Thirty sessions. The most important economic plants of the world are considered—their history, culture, formation of their useful products, and the extraction and preparation of the latter by man. Herbarium specimens and other material, as well as living plants in the conservatories and plantations of the Garden will be used for demonstrations. Because of its practical applications, this course will be of especial value to teachers. Two credits. *Fee*, \$10. *Mondays*, 4 p.m., beginning *October 8*.

Dr. Cheney.

B2. Nature Study.—A thirty hour course in two-hour sessions. Seven sessions in the fall; eight sessions in the spring. *For teachers only*. A concentrated course in alertness for Nature Curators,† designed to be of specific help in planning school nature lessons, supplying material, and preparing and exhibiting plant specimens. Two credits. *Class limited to 40 members*. *Fee*, \$10. *Tuesdays and Thursdays*, 4 p.m., fall term beginning *October 2*; spring term beginning *April 25, 1935*.

Miss Miner and Miss Dorward.

N.B.—Any student in this class desirous of finishing thirty hours during the fall may have, beginning Tuesday, October 30, one two-hour period a week on Nature Projects for Classrooms with Miss Shaw as instructor. (See Educational Principles of Children's Gardening and Nature Study, B4, for extra hours supplementing spring session.)

B3. Principles of Horticulture.—Thirty sessions. *For teachers only*. Open to beginners and to former members of

† In each Public School of New York City one teacher is selected as the garden teacher to be held responsible for the school garden in that school. "The special duty of the Nature Curators will be to assist the principal as he shall direct in using for nature study any or all of the nature contacts that may be available in his school. . . . Credit for salary increment, equivalent for one year, will be given to all nature curators who complete an approved thirty hour course in natural science or related subjects."

Principles of Agriculture and Horticulture (formerly B3; now discontinued). Lessons in potting and general care of house plants; methods of plant propagation, including the planting of bulbs; making cuttings (soft wood, hard wood, and leaf); sowing seeds; insect pests; plant diseases; making dish gardens; preparing for the outdoor garden. Most of this work is carried on in the greenhouses. Emphasis will be laid on problems of a practical nature. Two credits. *Fee, \$10. Wednesdays, 4 p.m., beginning September 26.* Miss Shaw and Miss Dorward.

B4. Educational Principles of Children's Gardening and Nature Study.—Eight two-hour sessions. No credit allowed except for members of B2, Nature Study Course. *Fee, \$5, except to students of B2, Nature Study. Tuesdays, 4 p.m., beginning January 29, 1935.* Miss Shaw.

B5. Children's Garden Practice.—(*Not offered in 1934-35.*) Miss Shaw.

B7. Greenhouse Work.—(*Included under B3 for 1934-35.*) Miss Dorward.

B8. Plant Culture.—Twenty sessions. Any student who has taken *Principles of Agriculture and Horticulture* (formerly B3; now discontinued) and Greenhouse Work, and is desirous of a place in the greenhouse for independent work with a monthly conference, should apply for this privilege on October 4. No credit. *Fee, \$10. Thursdays, 4 p.m., beginning October 18.*

Miss Shaw.

C. Children's Courses

The following courses are open to all boys and girls between the ages of eight and eighteen. Enrollment in these courses entitles the boy or girl to membership in the Boys' and Girls' Club of the Brooklyn Botanic Garden. Papers by members of the Club, on various botanical and horticultural subjects, are read at the meetings, and the speakers are then entitled to silver pins, providing they have satisfactorily completed work for their bronze medals and have received them. For information concerning the Children's Room, the Children's Building, and the Children's Garden, see pages 238-239.

C1. Fall Greenhouse Work.—The following courses are given for boys and girls interested in greenhouse work and botani-

cal nature study. *The fee is ten cents.* Miss Shaw and Assistants.

Class A.—Open to boys and girls from eight to twelve years old. *Saturday mornings at 9:15. October 20 to December 22.*

Class B.—Open to boys and girls twelve years of age and over. *Saturday mornings at 10:00. October 20 to December 22.*

C2. Special Activities.—Special work as applied to greenhouse and garden activities. Members for this class will be selected from honor students in the fall courses. Work is open only to boys and girls fourteen years old and over. *No fee.* Given in January and February, 1935. Miss Shaw and Miss Dorward.

C3. Preparation for the Outdoor Garden.—The following classes are open to boys and girls during the spring of each year. The courses are planned for a better understanding of plant life and so that the outdoor garden may become a more intelligent piece of work. *On account of limited space in the Children's Greenhouse, classes are limited to twenty. The fee for each is ten cents to cover the cost of material.* Miss Shaw and Assistants.

Class A.—Open to boys and girls from eight to twelve years old. *Saturday mornings at 9:15. March 2 to April 27.*

Class B.—Open to boys and girls twelve years of age and over. *Saturday mornings at 10:00. March 2 to April 27.*

C4. Advanced Work for Older Boys and Girls.—How to raise plants, mix soils, transplant, start seedlings for outdoor gardens, etc. Boys and girls who have taken spring courses under C5 are eligible for advanced work. *The fee for the course is twenty-five cents.* Each student may take home his plants and seedlings. This course is open to both boys and girls over twelve years of age. *Saturday mornings at 9:30; February, 1935.*

Miss Dorward.

C5. The Beginners' Outdoor Garden.—Open annually to 150 boys and girls who carry on their projects in gardening on plots 8 ft. by 10 ft. No person is eligible for a garden who has not been a member of spring classes. *Fee, twenty-five cents.* *Saturday mornings, 9-12, May 11 to October 5.*

Miss Shaw and Assistants.

C6. The Advanced Outdoor Garden.—Open to 75 boys and girls who have had several seasons in the Beginners' Garden (C5).

All candidates must have been in spring classes. *Fee, fifty cents. Saturday mornings, 9-12, May 11 to October 5.*

Miss Shaw and Assistants.

C7. Junior Garden Assistants.—Open to older boys and girls or to those who have mastered Courses C2 and C4. Size of plot 10 ft. by 15 ft. Registration date: *May 4. No fee.*

Miss Miner.

C9. Nature Study for Boy Scouts, Girl Scouts, Camp Fire Girls, Scout Leaders, and Others.—Short courses of at least four periods each, with talks, demonstrations, and field trips in the grounds of the Botanic Garden and Prospect Park to study trees, shrubs, etc. The instruction and schedule dates will be adapted to meet the needs of the various groups that apply. *Open only to groups of at least ten persons. Hours to be arranged. No fee.*

Dr. Graves, Miss Miner, and Assistants.

C10. Special Work for High School Pupils.—A course in gardening or greenhouse work for high school pupils. Classes to be arranged for by the high school teacher. *Fee for materials used.*

Miss Shaw and Assistants.

D. Course for Student Nurses

D1. General Botany With Special Reference to Medicinal Plants.—A course of 10 spring and 10 fall lectures, demonstrations, and field trips for student nurses. Arranged in co-operation with various hospitals. The general principles governing the life of plants, as well as the use and care of flowers and potted plants in the sick room, will be considered. Special attention will be paid to the identification of officinal plants in the field. Hours to be arranged. *No fee.*

Dr. Graves.

E. Investigation

1. Graduate Work for University Credit

By the terms of a cooperative agreement between New York University and the Brooklyn Botanic Garden, properly qualified graduate students may arrange to carry on independent investigations in botany at the Garden under the direction of members of the Garden Staff, who are also officers of instruction in the Grad-

uate School of the University. The advantages of the laboratory, herbarium, and collections of living plants at the Garden are freely at the disposal of students registered at New York University for such work. Such properly enrolled graduate students are charged no additional fees by the Garden. The following courses are approved by the faculty of the Graduate School of New York University and are given credit as full courses:

E6. Research in Mycology and Plant Pathology.—Investigation of problems relating to fungi and fungous diseases of plants. Dr. Reed.

E8. Research in Forest Pathology.—Investigation of the diseases of woody plants. Dr. Graves.

E9. Research in Systematic Botany of the Flowering Plants.—Investigation relating to the classification of the higher plants. Dr. Gundersen and Dr. Svenson.

2. Independent Investigation

The facilities of the laboratories, conservatories, library, and herbarium are available to qualified investigators who wish to carry on independent researches in their chosen field. There is a charge of \$25 per year, payable to the Botanic Garden.

V

MISCELLANEOUS

Press Releases

In order to keep the public informed of events at the Garden, news items are sent at fairly regular and frequent intervals to the metropolitan dailies and to many of the suburban papers. These news releases consist of announcements of the periods when the principal floral displays are at their best, of the acquisition of new plants, the blossoming of rare species, improvements in the plantations, the installation of new collections and exhibits, the results of research and exploration, etc. The beginnings of the various public courses, as well as public lectures, meetings of various societies at the Garden, Flower Days, and social events are also announced through the public press.

Broadcasting

Radio broadcasting has now become an integral part of the educational program. During 1933 members of the Garden personnel gave 28 radio talks on general botanical or horticultural topics and concerning the Brooklyn Botanic Garden, as follows: Over WOR, 12; WNYC, 15; WINS, 1.

The talks over WOR were given in cooperation with the Co-operative Extension Work in Agriculture and Home Economics of the State of New Jersey. In connection with these talks a Radio Garden Club and a Junior Radio Garden Club have been organized. Bulletins are sent regularly to the members of these clubs, and a "fan" mail has developed as a bureau of information on horticultural topics.

Broadcasting, including the cooperation with the State of New Jersey, is being continued during 1934, and will be continued during 1935. Those interested should watch the daily paper announcements for talks on gardening and plant life.

Circulars of Information

Circulars descriptive of the various courses and lectures are distributed, without charge, according to a regular mailing list which includes Brooklyn Botanic Garden officials and members, members of The Woman's Auxiliary, all the libraries and schools of Greater New York, registered and former students, and others. Requests to be placed on this mailing list should be addressed to the *Curator of Public Instruction*.

Popular Publications

Leaflets.—The publication of the Brooklyn Botanic Garden *Leaflets* commenced in 1913. Approximately ten numbers—sometimes more—constitute a Series, one series being issued each year. The current series is Number XXII. At the end of every four years, for convenience in binding, a table of contents of the *Leaflets* published during the four year period is issued.

The purpose of the *Leaflets* is primarily to present popular information about plant life in general for teachers and others, and to give announcements concerning flowering and other plant activities to be seen in the Garden near the date of issue. The

Leaflets are free to members of the Garden and (on request) to teachers in the schools of Greater New York. For others, the subscription is 50 cents per year, or 5 cents a number (4 pages); double or triple numbers (8 or 12 pages) at the same rate.

Besides the *Leaflets*, numerous popular articles on various phases of plant life and gardening are written by members of the staff for publication in periodicals and newspapers.

The Plant World.—By C. Stuart Gager. A popular introduction to the more interesting facts concerning the plant life of the earth, and the importance of plants in our daily lives. 136 pages; 79 illustrations. Price 75 cents. On sale at the Information Desk and Entrance Gates, and by mail.

A Teaching Guide to the Trees and Shrubs of Greater New York.—By Arthur H. Graves and Hester M. Rusk. A handbook used in Botanic Garden classes, of brief, non-technical descriptions of the woody plants of the Greater New York region, with the characters by which they may be recognized in summer or winter. Keys, a glossary, and index are appended. ix + 76 pages. Price 75 cents. On sale at the Information Desk and Entrance Gates, and by mail.

Illustrations of Flowering Plants of the Middle Atlantic and New England States.—By the late George T. Stevens, M.D. Edited by Alfred Gundersen. Contains 199 plates and index of about 1500 species of the commoner flowering plants, exclusive of the grasses and sedges. Reprinted primarily for use in Brooklyn Botanic Garden classes. Price \$1.00. On sale at the Information Desk and Entrance Gates, and by mail.

Guide Books, Maps, and Souvenir Postcards of the Garden

During the last few years, Guide Books have been published from time to time, as special numbers of the *Brooklyn Botanic Garden Record*, based upon and explaining various Botanic Garden features and exhibits.

Each of these publications is more than a guide to an exhibit; it is an elementary treatise on the general subject illustrated by the Garden feature or exhibit. In this way the Guides have value even for those who may not be able to visit the Botanic Garden. The following numbers have been published:

Guide No. 2. Gardens within a garden: A general guide to the grounds of the Brooklyn Botanic Garden. By C. Stuart Gager. May, 1929. 36 pages, 16 illustrations and map. Price, 25 cents. Out of print.

Guide No. 3. The story of our metate: A chronicle of corn. By F. W. Hodge. November, 1929. 25 pages, 14 illustrations. Price, 25 cents.

Guide No. 4. The Japanese Garden of the Brooklyn Botanic Garden. By Bunkio Matsuki. July, 1930. 38 pages, 20 illustrations. Price, 35 cents; by mail, 40 cents. Out of print.

Guide No. 5. The Rock Garden of the Brooklyn Botanic Garden. By Montague Free. May, 1931. 55 pages, 28 illustrations. Price, 35 cents; by mail, 40 cents.

Guide No. 6. Japanese potted trees (Hachinoki). By Bunkio Matsuki. November, 1931. 16 pages, 11 illustrations. Price, 35 cents; by mail, 40 cents.

Guide No. 7. The story of our boulders: Glacial geology of the Brooklyn Botanic Garden. By C. Stuart Gager and Ernst Antevs. May, 1932. 43 pages, 22 illustrations. Price, 35 cents; by mails, 40 cents.

Guide No. 8. The story of fossil plants. Guide to the eight transparencies in Conservatory House No. 2. By Edward W. Berry. July, 1932. 29 pages, 8 illustrations. Price, 35 cents; by mail, 40 cents.

These Guides are mailed free, as published, to members of the Garden. Similar guides are in preparation and will be published from time to time.

A detailed map of the Garden, showing not only the various types of gardens included in the Botanic Garden area, but especially the location of the various orders and families in the Systematic Section, is appended to the General Guide. Copies are on sale at 5 cents each.

A colored picture map of the Garden, $7\frac{1}{2} \times 3\frac{1}{2}$ feet, designed and executed by Miss Helen Sewall, is on view in the Laboratory Building. This map was presented to the Garden at the Annual Spring Inspection, May 14, 1929, as a memorial to the late Dr. Glentworth R. Butler by members of the Woman's Auxiliary and other friends of Dr. Butler. Photographs of this map (in black and white, $6\frac{1}{2} \times 4\frac{1}{4}$ inches) may be had at 20 cents each.

Souvenir postcards, in colors, may be had at 10 cents at set (7 cards); three for 5 cents; 2 cents each. The subjects are: Scene in the Children's Garden; The Brook; Daffodils in the Lawn; The Lake; Children's Building and Formal Garden; The Rock Garden (Waterfall and Iris); The Japanese Garden (Wisteria); Inflorescence of Sago Palm.

Orders for guide books, maps, and souvenir postcards, accompanied by remittance, should be sent to *The Secretary*. These articles may also be obtained at the Information Desk in the Laboratory Building, and at the Entrance Gates.

VI

OTHER EDUCATIONAL FEATURES

Plantations

The plantations comprise the following sections:

1. General Systematic Section (trees, shrubs, and herbaceous plants arranged according to orders and families).
2. Local Flora Section (Native wild flower garden). Arrangement ecological.
3. Ecologic Garden.
4. Japanese Garden.
5. Rock Garden.
6. Rose Garden.
7. Iris Garden.
8. Water Gardens (Lake, Brook, Swamp, Bog, Pools).
9. Children's Garden.
10. Shakespeare Garden.
11. Horticultural Garden.
12. Conservatory Plaza (Water Lilies, Herbaceous Borders).
13. Laboratory Plaza (Magnolias).
14. Experimental Garden (Test Garden for beardless Iris; Plant Pathology and Plant Breeding Plots).
15. Nursery.

As noted under *Docentry* (p. 216) arrangements may be made for viewing the plantations under guidance. They are open free to the public daily from 8 a.m. until dusk; on Sundays and holidays from 10 a.m. until dusk.

Systematic Section

The main part of the outdoor plantations is devoted to the Systematic Section, which extends from north to south through the central part of the Garden. Here the plants are grouped according to their botanical relationships, in orders, families, and genera, following approximately the Engler system of plant classification. From the simpler and more primitive types of plants at the north end, to the more highly developed groups at the south, the Systematic Section comprises representative members of the families of plants which are hardy or semi-hardy in this climate. In accordance with this arrangement, the ferns and the conifers and other gymnosperms are at the northern end. Then follow the trees, shrubs, and herbaceous plants of the various families of dicotyledons. Along the east side of the Brook are the polypetalae. Along the west side of the Brook are the monocotyledons, and the sympetalae. The catkin-bearing trees and shrubs follow the line of the Brook. Wherever possible, the plants chosen to represent their groups are those which are of interest from both botanical and horticultural points of view.

Local Flora Section

This is an area of about two acres devoted to plants native within approximately 100 miles of Brooklyn (the Torrey Botanical Club range). The following ecological units are represented: bog, sand barren, pond, meadow, and woodland. Nearly all the native plants of general interest are well established here, with the exception of the limestone (calciphile) ferns, for which there is as yet no suitable place. Although the section is not yet open to the general public, arrangements may be made with the *Curator of Public Instruction* for its inspection by botany classes, to whose needs this area is especially adapted.

Japanese Garden

The Japanese Garden, first opened to the public in 1915, was a gift to the Botanic Garden from Mr. Alfred T. White, "the father of the Botanic Garden." The design, by the Japanese landscape architect, Mr. Takeo Shiota, carries out faithfully the Japanese

idea of a *Niwa*, or landscape garden. From the tea house (near the east entrance) one can see the *machiai* or "rest house," the island with the drum bridge, bronze storks, stone and wooden lanterns, the waterfalls, and the wooden Torii standing in the lake, recalling the one at Miyajima, Japan. Since January 1, 1919, the Garden has been in charge of Miss Mary Averill, honorary curator of Japanese gardening and floral art, and has been steadily improved, under her supervision, by Japanese gardeners. For details and explanations of the meaning of the various features see "The Japanese Garden of the Brooklyn Botanic Garden": Guide No. 4. (*Brooklyn Botanic Garden Record* 19: 197-234. July, 1930.)

Rock Garden

The Rock Garden, constructed in the spring of 1916, is, in point of time, perhaps, the first rock garden of any considerable size in a public garden or park in the United States. The rocks used in its construction are glacial boulders which were uncovered in the course of grading operations on other parts of the grounds; they are the only "native" rocks on Long Island, with the exception of one small outcrop on the northwest shore. The general idea in making the garden was that of representing a boulder-strewn slope, but this design, of necessity, was modified in places to provide proper cultural conditions as to drainage, depth of soil, and shade. The garden is planted with about eight hundred species and varieties of alpine, saxatile, and other plants suitable for rock garden culture.

Although the rock garden enthusiast may expect to find something of interest in bloom during every month of the year, it is in April, May, and June that the Rock Garden provides its greatest display of blossoms. Persons interested in rock gardening will find Guide No. 5, *The Rock Garden of the Brooklyn Botanic Garden*, helpful; also, *Leaflets*, series XI, No. 6, *The Rock Garden*.

Rose Garden

The Rose Garden, occupying about one acre in the northwest part of the Botanic Garden, was formally opened to the public

on Sunday afternoon, June 24, 1928. This garden was made possible by a gift of \$10,000, later increased to \$15,000, from Mr. and Mrs. Walter V. Cranford, of Greenwich, Connecticut.

The general plan of the Garden is as follows. At the north end, entrance is gained through a Doric pergola. Three parallel rows of beds extend to the southward from the pergola, as far as the pavilion. In the central row of beds, varieties of hybrid perpetuals have been planted along with many of the small polyantha type; each of the two side rows contains varieties of hybrid teas. In the arrangement of these varieties the older forms appear at the beginning, near the pergola, the most recent productions near the pavilion, with the intermediate forms in chronological sequence between. Varieties of pillar and post roses are planted at regular intervals, on suitable supports, in the beds, with standards between the beds of the side rows. The trellis surrounding the garden, and also the pergola and pavilion, furnish support for climbing roses, while the marginal beds along the trellis are for wild species and their derivatives. South of the pavilion, three additional beds are devoted to historical roses, *i.e.*, those mentioned in ancient literature, and to roses of commercial use.

The Rose Garden is open to the public from 9 a.m. to 5 p.m. on weekdays (except holidays) during the rose season, and from 9 a.m. to 7 p.m. in June. Children are admitted only when accompanied by responsible adults.

Flower Days

In order to afford members of the Garden and friends whom they may invite, an opportunity to see, under expert guidance, some of the most conspicuous and interesting floral displays of the Garden; to assist them toward solving some of their own gardening problems; and to enable them to meet for discussion, a series of special days, called Flower Days, was inaugurated in 1927. The dates selected are those in which the particular flowers furnishing the theme for discussion are in their prime. Up to and including 1934 the following "Days" have been observed:

Crocus Day	Rose Garden Day (June)
Daffodil Day	Japanese Iris Day
Tulip Day	Water Garden Day
Rock Garden Day	Fall Rose Garden Day
Japanese Garden Day	Canna Day
Iris Day	Chrysanthemum Day

On each of these occasions a specialist gives an illustrated talk on the flower of the Day, followed by a tour of inspection of the flowers in bloom on the grounds of the Garden. The speakers are either members of the Garden staff who have made a special study of the flowers in question, or invited experts in their breeding or growing. During the outdoor inspection, members may discuss with the leader questions of desirable varieties, culture, disease, etc. On the return to the Laboratory Building, tea is served. The exercises commence at 3:30 p.m.

These Flower Days, now an established feature of the Garden's activities, have come to be of more than local interest. In 1934 the Botanic Garden's "Rock Garden Day" was the occasion of the first annual meeting of the American Rock Garden Society. Similarly, in other years, the American Iris Society and the American Rose Society have held their meetings at the Garden and have joined with the Garden members in the celebration of their respective Flower Days.

Conservatories

The Garden conservatories contain a collection of tender and tropical plants. Of special interest for teachers of nature study and geography are the following useful plants from the tropics and subtropics: banana, orange, lemon, lime, kumquat, tamarind, West Indian cedar (the source of the wood used for cigar boxes), eucalyptus, Manila hemp, sisal, pandanus (source of the fiber used for making certain kinds of fiber hats), fig, grapevines from north and south Africa, date palm, coconut palm, chocolate tree, coffee, tea, ginger, bamboo, mahogany, balsa, cocaine plant, black pepper, annatto (used in coloring butter and cheese), cardamom, olive, pomegranate, logwood, durian, mango, sugar cane, avocado (so-called "alligator pear"), West Indian and other rubber plants, banyan, religious fig of India, and numerous others.

It may be of interest to teachers of botany that the nine extant genera of cycads are now represented in House 12. To reach the Cycad House take the first door to the *left* after entering the central or Economic House and pass through to the end house.

The Conservatories are open April 1 to October 31, 10 a.m.-4:30 p.m. (Sundays, 2-4:30); November 1 to March 31, 10 a.m.-4 p.m. (Sundays, 2-4).

Herbarium

The Garden herbarium consists at present of about 200,000 specimens, including phanerogams, ferns, mosses, liverworts, lichens, parasitic and other fungi, algae, and myxomycetes. This collection may be consulted daily (except Sundays and holidays) from 9 a.m. until 5 p.m., Saturdays from 9 a.m. to 12 m. Specimens submitted for identification will be gladly received.

Library

The rapidly growing library of the Garden comprises at present approximately 18,000 volumes and more than 14,000 pamphlets. This is not a circulating library, but is open free for consultation to all persons daily (except Sundays and holidays) from 9 a.m. until 5 p.m. (Saturdays, 9 to 12). Nearly 1,000 periodicals and serial publications devoted to botany and closely related subjects are regularly received. These include the transactions of scientific societies from all quarters of the globe; the bulletins, monographs, reports, and other publications of various departments of the United States Government, as well as those of foreign governments, and of all state agricultural experiment stations and agricultural colleges; the publications of research laboratories, universities, botanic gardens, and other scientific institutions of the world, as well as the files of independent journals devoted to the various phases of plant life. The library is specially rich in publications of foreign countries and has a growing collection of incunabula and other pre-Linnean works.

Bibliographical assistance is rendered to readers by members of the Library staff.

Laboratory Building

The Laboratory Building contains (besides offices of administration and the Library and Herbarium mentioned above) four laboratory rooms, a culture room, three classrooms with stereopticon and other equipment for instruction, a room for the installation of temporary exhibits, six private research rooms, and an auditorium seating about 570 and equipped with motion picture machine, stereopticon, and lecture table supplied with water, gas, and electric current for lectures involving experimental work.

Instructional Greenhouses

A range of three greenhouses, each about 20 x 30 feet, is provided for the practical instruction of children and adults in plant propagation and other subjects.

Children's Room

A gift of \$1,500 in 1921 from Mrs. Helen Sherman Pratt, supplemented in 1923 by a further gift of \$500 from Mr. George D. Pratt, has made it possible to provide a beautifully decorated room for the use of the Boys' and Girls' Club. Any boy or girl who is enrolled, or has been enrolled, in any of the children's classes at the Garden is eligible for membership in this club, which now numbers about 1,000 active members. The room contains shelves for a nature-study library, of which a nucleus has already been secured, and is equipped with stereoscopic views, photographs, and preserved and living specimens of plant life, for the instruction and entertainment of boys and girls. The room is open free to all children. Contributions of specimens and of books on nature study and closely related subjects will be most welcome.

Children's Building

This is located in the northern part of the Children's Garden plot and contains a conference room, and rooms for the storage of garden tools and implements. The furniture in the conference room was a gift from Mrs. James H. Post. Various collections of plants, seeds, and insects of economic importance in the garden

are accessible here for consultation by the children. A garden library, a gift of friends, has been added. North of the Children's Building is a plot planted to ornamental shrubs and herbaceous perennials for the instruction of the children.

Children's Garden

A plot of about three-quarters of an acre in the southeast part of the Botanic Garden is devoted to the theoretical and practical instruction of children in gardening. The larger part of this area is laid out in garden plots which will accommodate about 200 children. At the south end is a Shakespeare Garden, given by Mrs. Henry W. Folger.

Non-Botanical Educational Features

Meridian Panel.—In 1931 there was placed in the paved walk in front of the main west entrance to the Laboratory Building a Terrestrial Position Panel, briefly referred to as the "Meridian Panel." This panel, of black Belgian marble terrazzo, is 21 feet, 2 inches long, and 5 feet wide. It contains a brass strip, 20 feet long and $\frac{7}{8}$ inch wide, laid along the geographical meridian, the location of which was accurately determined by Mr. Weld Arnold, then of the School of Surveying of the American Geographical Society, but now of the School of Geography, Harvard University.

Another brass strip, $18\frac{1}{2}$ feet long and $\frac{3}{8}$ inch wide, marking the magnetic meridian, crosses the geographical meridian at an angle of $11^{\circ} 11'$. The data at the ends of the meridians are as follows:

At the North End:

Magnetic north. Variation $11^{\circ} 11'$ west in 1931

Annual increase $4'$

At the South End:

Altitude above mean sea level, 115 feet

North latitude, $40^{\circ} 40' 06''$

Longitude west of Greenwich, $73^{\circ} 57' 48''$

To the North Pole, 3416.7 miles

To the Equator, 2798.2 miles

This feature is proving of much public interest, and the data are constantly being copied by school classes and others.

Armillary Sphere.—The central feature of the Laboratory Plaza is the large Compass and Armillary Sphere erected in 1933. This was made possible through a bequest of the late Alfred W. Jenkins, a former member of the Botanic Garden Governing Committee. The Armillary Sphere consists of circular bands of bronze representing the principal celestial circles, and has been designed to serve also as a sun dial. Strictly, an armillary sphere should have either the earth or the sun represented in its center, but here, in order to make it serve as a sun dial, these are omitted, and a slender metal rod, extending from the south to the north pole of the sphere, serves as a gnomon. From the shadow thrown by this rod the correct sun time is indicated on a dial on the inner surface of the equatorial band. By means of the "Equation of Time" inside the sphere, this can be changed to Standard Time. The signs of the zodiac are to be seen on the outside of this broad band (as the band of the ecliptic where they are usually placed is too narrow to receive them): they were modelled by Miss Rhys Caparn, sculptor. The north pole points to the North Celestial Pole. The sphere is mounted on a pedestal of Carver black granite from Vinal Haven, Maine. A bronze band encircling the pedestal bears the following classic sun dial motto:

"Serene I stand amyddst ye flowres
To tell ye passing of ye howres."

The pedestal rests on an octagonal platform of Stony Creek (Connecticut) pink granite, and the whole is mounted at the center of a large circular compass paved with marble terrazzo in four colors, each color representing a different point of the compass. The marble chips used in the terrazzo are of various origins, the red marble coming from Massa, Italy, the black from Mazy, Belgium, the green from Cardiff, Maryland, and the yellow from Siena, Italy.

Labelled Boulders.—The Brooklyn Botanic Garden is located near the western end of the terminal moraine of Long Island. This moraine was deposited at the southern edge of the continental glacier that occupied the northern part of North America, during

the last Ice Age. The southward-moving ice picked up and carried along innumerable boulders derived from rock ledges in various localities north of what is now Long Island. During their journey, these boulders were rounded and polished and, in some cases, marked with striations that still persist. Twenty-eight of these boulders have had their lithological composition carefully determined and compared with that of rock ledges to the north. By this study it has been possible to determine, with a fair degree of accuracy, the approximate places from which the boulders now in the Botanic Garden were derived. Bronze tablets, given by President Edward C. Blum, of the Board of Trustees, have been placed on these boulders, telling their composition and probable place of origin, and stating that they were brought to the Garden by the continental ice-sheet during the glacial period.

A similar bronze tablet is mounted on a boulder at the foot of Boulder Hill (which takes its name from the large glacial erratic on its summit). The inscription reads, "Boulder Hill and the entire northern portion of the Botanic Garden are part of the terminal glacial moraine extending from The Narrows to Montauk Point. This tablet was given in 1932 by the Boys' and Girls' Club of the Brooklyn Botanic Garden."

Guide No. 7, *The story of our boulders*, has been prepared for the uses of classes in geography or geology, or others who may be interested, and may be obtained at the Information Desk and Entrance Gates. Arrangements may be made in advance for docents to conduct classes who wish to study these labelled boulders.

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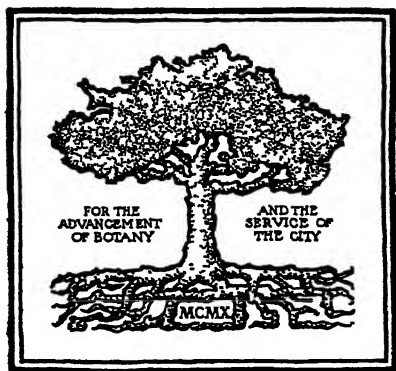
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C. STUART GAGER



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INFORMATION CONCERNING MEMBERSHIP

The Brooklyn Institute of Arts and Sciences is organized in three main departments: 1. The Department of Education. 2. The Museums. 3. The Botanic Garden.

Any of the following seven classes of membership may be taken out through the Botanic Garden:

1. Annual member	\$ 10
2. Sustaining member	25
3. Life member	500
4. Permanent member	2,500
5. Donor	10,000
6. Patron	25,000
7. Benefactor	100,000

Sustaining members are annual members with full privileges in Departments one to three. Membership in classes two to seven carries full privileges in Departments one to three.

In addition to opportunities afforded to members of the Botanic Garden for public service through cooperating in its development, and helping to further its aims to advance and diffuse a knowledge and love of plants, to help preserve our native wild flowers, and to afford additional and much needed educational advantages in Brooklyn and Greater New York, members may also enjoy the privileges indicated on the following page.

Further information concerning membership may be had by addressing The Director, Brooklyn Botanic Garden, Brooklyn, N. Y., or by personal conference by appointment. Telephone, Prospect 9-6173.

PRIVILEGES OF MEMBERSHIP

1. Free admission to the buildings and grounds at all times.
2. Cards of admission for self and friends to all exhibitions and openings preceding the admission of the general public, and to receptions.
3. Services of docent (by appointment), for self and party (of not less than six), when visiting the Garden.
4. Admission of member and one guest to field trips and other scientific meetings under Garden auspices, at the Garden or elsewhere.
5. Free tuition in most courses of instruction; in other courses a liberal discount from the fee charged to non-members.
6. Invitations for self and friends to spring and fall "Flower Days," and to the Annual Spring Inspection.
7. Copies of Garden publications, as follows:
 - a. RECORD (including the ANNUAL REPORT).
 - b. GUIDES (to the Plantations and Collections).
 - c. LEAFLETS (of popular information).
 - d. CONTRIBUTIONS (on request. Technical papers).
8. Announcement Cards (Post Card Bulletins) concerning plants in flower and other items of interest.
9. Privileges of the Library and of the Herbarium.
10. Expert advice on the choice and care of ornamental trees, shrubs, and herbaceous plants, indoors and out; on planting the home grounds; the care of lawns; and the treatment of plants affected by insect and fungous pests.
11. Determination of botanical specimens.
12. Participation in the periodical distribution of surplus plant material and seeds, in accordance with special announcements sent to members from time to time.
13. Membership privileges in other botanic gardens and museums outside of Greater New York, when visiting other cities and on presentation of membership card in Brooklyn Botanic Garden.

OUT-OF-TOWN MEMBERSHIP PRIVILEGES

In accordance with a cooperative arrangement with a number of other institutions and organizations, Brooklyn Botanic Garden members, when visiting other cities, may, on presentation of their Botanic Garden membership card at the office of the cooperating museum or organization, be accorded, without charge, the same privileges as are enjoyed by the members of that institution, including admission to exhibits and lectures, and invitation to social events. This does not include being enrolled on the mailing list for publications, and does not include free admission to the Philadelphia and Boston spring Flower Shows.

In reciprocation, the members of the cooperating units, when visiting the Metropolitan district of Greater New York, will be accorded full membership privileges at the Brooklyn Botanic Garden.

The cooperating units, as of October, 1935, are as follows:

Academy of Natural Sciences, Philadelphia, Pa.
 Berkshire Museum, Springfield, Mass.
 Boston Society of Natural History, Boston, Mass.
 Buffalo Museum of Science, Buffalo, N. Y.
 California Academy of Sciences, San Francisco.
 Carnegie Museum, Pittsburgh, Pa.
 Charleston Museum, Charleston, S. C.
 Everhart Museum of Natural History, Science and Art, Scranton, Pa.
 Fairbanks Museum of Natural Science, St. Johnsbury, Vt.
 Field Museum of Natural History, Chicago, Ill.
 Los Angeles Museum, Los Angeles, Calif.
 Massachusetts Horticultural Society, Boston, Mass.
 Missouri Botanical Garden, St. Louis, Mo.
 Newark Museum, Newark, N. J.
 New York State Museum, Albany, N. Y.
 Peabody Museum of Archaeology and Ethnology, Cambridge, Mass.
 Pennsylvania Horticultural Society, Philadelphia, Pa.
 Philadelphia Commercial Museum, Philadelphia, Pa.
 Southwest Museum, Los Angeles, California.

REGULATIONS CONCERNING PHOTOGRAPHING, PAINTING, AND SKETCHING

1. No permit is required for photographing with a hand camera, or for sketching or painting without an easel on the Grounds or in the Conservatories.

2. Sketching and painting with an easel and the use of a tripod camera are not allowed in the Japanese Garden, the Rose Garden, the Local Flora Section (Native Wild Flower Garden), nor the Conservatories at any time without a permit. No permits are given for use after 12 o'clock noon on Sundays and holidays.

3. Artists, and the public in general, may not bring into the Botanic Garden chairs, stools, or anything to sit in or on.

4. Holders of permits must not set up tripod cameras nor easels in such a way as to involve injury to living plants or lawns, nor to cause an obstruction to traffic on congested paths or walks.

5. Application for permits should be made at the office of the Director, Laboratory Building, Room 301, or by mail (1000 Washington Avenue), or by telephone (PRespect 9-6173).

GENERAL INFORMATION CONCERNING THE ACTIVITIES OF THE BROOKLYN BOTANIC GARDEN

THE BROOKLYN BOTANIC GARDEN, established in 1910, is a department of the Brooklyn Institute of Arts and Sciences. It is supported in part by municipal appropriations, and in part by private funds, including income from endowment, membership dues, special contributions, and tuitions. Its articulation with the City is through the Department of Parks.

By an Agreement with the City of New York, the functions of the Garden have been defined as two-fold: first, the advancement of botanical science through original research; and second, the dissemination of a knowledge of plants.

The first of these activities is carried on by director, curators, resident investigators, fellows, and others, who devote all or a part of their time to independent investigation. At present these investigations include studies in genetics, plant pathology, systematic botany, anatomy, physiology, economic botany, and horticulture.

The second function of the Garden, namely, the dissemination of botanical knowledge, is accomplished in the following ways:

I. By the teaching of classes—

- (a) of adults who are interested in some phase of pure or applied botany, or of horticulture;
- (b) of teachers of botany, biology, and nature study, who come for special courses on the subject matter or teaching methods of their subjects;
- (c) of children who come voluntarily outside of school hours;
- (d) of children who come with their teachers from public and private schools for special lessons on plant life and closely related subjects.

II. By lectures at schools, garden clubs, and elsewhere by staff members.

III. By broadcasting.

IV. By loan sets of lantern slides accompanied by lecture text, for use in the schools.

- V. By the distribution to schools of study material for classes in botany, biology, and nature study.
- VI. By public lectures and educational motion pictures at the Botanic Garden.
- VII. By maintaining labelled collections of living plants, arranged systematically, ecologically, and otherwise on the grounds and in the Conservatories of the Garden.
- VIII. By the herbarium, containing specimens of preserved plants from all parts of the world.
- IX. By maintaining a reference library on plant life and related subjects, open free to the public daily (except Sundays and holidays).
- X. By the following periodicals and publications issued by the Botanic Garden:
 1. American Journal of Botany (Monthly, except August and September).
 2. Ecology (Quarterly).
 3. Genetics (Bimonthly).
 4. Brooklyn Botanic Garden RECORD, including Annual Report and Guides (Quarterly).
 5. Leaflets (Weekly or biweekly in Spring and Fall).
 6. Contributions (Irregular).
 7. Memoirs (Irregular).
 8. Miscellaneous:
 - Syllabi of lectures.
 - Guide sheets for classes.
 - Announcement cards and circulars.
 - Bibliographies.
 - Miscellaneous books and booklets.
- XI. By popular and technical articles in journals and the public press, including regular "News Releases" concerning Botanic Garden activities and events.
- XII. By the maintenance of a Bureau of Public Information on all phases of plant life.
- XIII. By providing docents to accompany members and others who wish to view the collections under guidance.
- XIV. By the installation of botanical and horticultural exhibits at

the Garden, the International Flower Show, and elsewhere.

XV. By cooperating with New York City Departments (e.g., Board of Education, Board of Higher Education, Department of Parks, Board of Health, and the Municipal Broadcasting Station—WNYC) and other agencies, in the dissemination of botanical knowledge.

The Brooklyn Botanic Garden is also taking an active part in the nation-wide movement for Scenic Preservation and legislation for the conservation of our native American plants.

A brief summary and report of the public educational work of the Garden from 1910 to 1928, with some attempt to set forth the fundamental principles upon which it is based, was published in the Brooklyn Botanic Garden RECORD for July, 1929. This is now out of print, but may be found on file at most of the larger libraries of the country.

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Plantations, comprising Systematic Section, Local Flora Section, Japanese Garden, Rock Garden, Rose Garden, and various Horticultural Displays. Flower Days. Conservatories, Herbarium, Library, Laboratory Building, Instructional Greenhouses, Children's Room, Children's Building, Children's Garden. Shakespeare Garden, Meridian Panel, Armillary Sphere, Labelled Boulders, Etc.

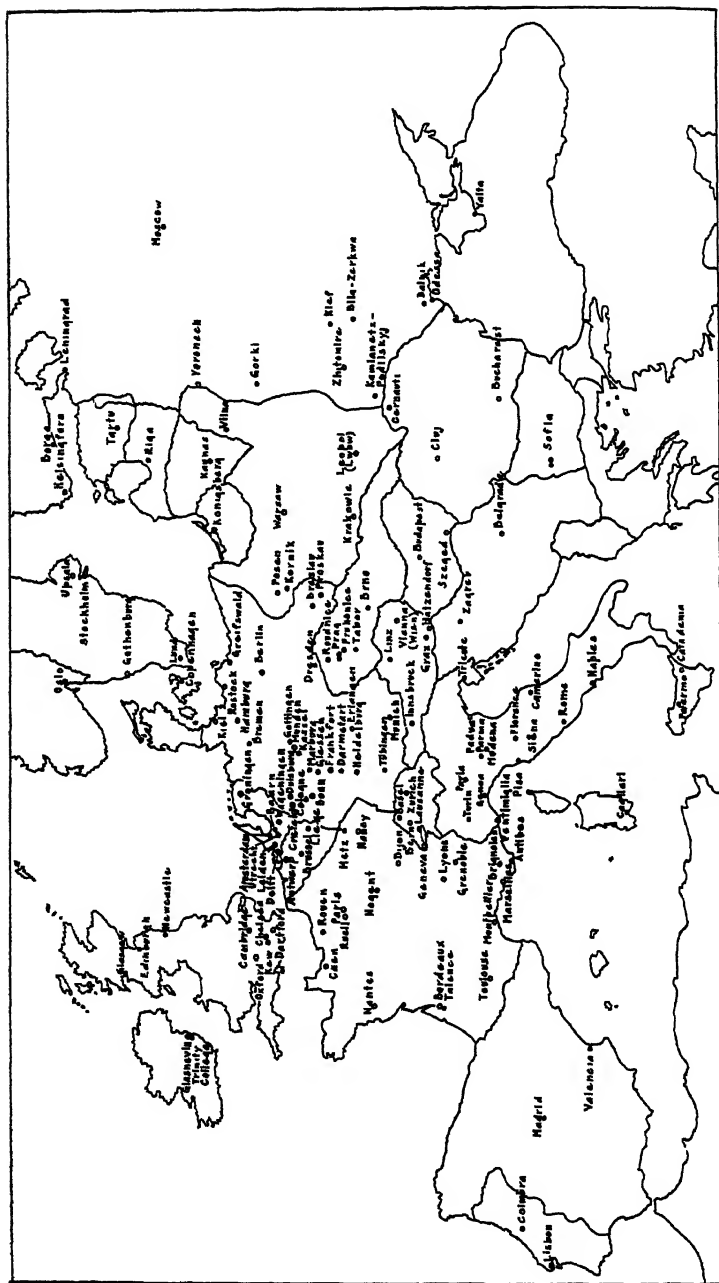


FIG. 1. Map of Europe showing, as of November, 1934, the location of botanic gardens from which Brooklyn Botanic Garden has received seed-exchange lists in recent years.

BROOKLYN BOTANIC GARDEN RECORD

VOL. XXIV

JANUARY, 1935

NO. 1

DELECTUS SEMINUM, BROOKLYN 1934

LIST OF SEEDS OFFERED IN EXCHANGE

These seeds, collected during 1934, are offered to botanic gardens and to other regular correspondents; also, in limited quantities, to members of the Brooklyn Botanic Garden. They are not offered for sale.

Please note that applications for seeds must be received during January or February. Seeds are mailed early in March. No seeds are available at other times of the year.

Seeds collected from wild plants are designated by an asterisk (*).

SEEDS OF TREES AND SHRUBS

GYMNOSPERMAE

Ginkgoaceae

Ginkgo
biloba L.

Taxaceae

Taxus
*canadensis Marsh.

Pinaceae

Picea
*canadensis B.S.P.

Cupressaceae

Chamaecyparis
*thyoides Britt.
Juniperus
*communis L. var. depressa
Pursh
virginiana L.

Gnetaceae

Ephedra
distachya L.

DICOTYLEDONES

Aceraceae 163

Acer
ginnala Maxim.

Anacardiaceae 153

Pistacia
chinensis Bge.

Rhus

- *copallina L.
- *glabra L.
- *Toxicodendron L. (Poison Ivy)
- *typhina L.
- *vernix L. (Poison Sumac)

Annonaceae 98

- Asimina
- triloba Dunal

Aquifoliaceae 157

- Ilex
- serrata Thunb.
- *verticillata (L.) Gray
- Nemopanthus
- *mucronata Trel.

Araliaceae 227

- Acanthopanax
- divaricatus Seem.
- Henryi Harms
- senticosus Harms

Berberidaceae 93

- Berberis
- canadensis Mill.
- diaphana Maxim.
- Gilgiana Fedde
- koreana Palib.
- x notabilis Schneid.
- Poiretii Schneid.
- Sieboldii Miq.
- turcomanica Karelin var.
- integerrima Schneid.

Betulaceae 61

- Betula
- *populifolia Ait.
- Carpinus
- betulus L.
- *caroliniana Walt.
- Ostrya
- virginiana K. Koch

Bignoniaceae 258

- Catalpa
- bignonioides Walt.

Cactaceae 210

- (Opuntia
- tortispina Engelm.

Calycanthaceae 96

- Calycanthus
- fertilis Walt. var. ferox
- Rehd.

Caprifoliaceae 271

- Diervilla
- Lonicera Mill.
- rivularis Gatt.
- Lonicera
- alpigena L.
- Ferdinandi Franch.
- Henryi Hemsl.
- Maackii Maxim.
- Morrowii A. Gray
- musciensis Rehd.
- quinquelocularis Hardw.
- tatarica L.
- Sambucus
- *canadensis L.
- Symphoricarpos
- albus (L.) Blake (S. racem-
osus Michx.)
- albus var. variegatus Blake
- occidentalis Hook.
- Viburnum
- *acerifolium L.
- *alnifolium Marsh.
- *cassinoides L.
- *dentatum L.
- dilatatum Thunb.
- dilatatum var. xanthocar-
pum Rehd.
- *Lentago L.
- prunifolium L.
- Sieboldii Miq.
- theiferum Rehd.

Celastraceae 158

- Celastrus
 orbiculatus Thunb.
 (C. articulatus Thunb.)
 scandens L.
- Evonymus
 americana L.
 Bungeana Maxim.
 oxyphylla Miq.
 patens Rehd.
 yedoensis Koehne

Cercidiphyllaceae 90a

- Cercidiphyllum
 japonicum Sieb. & Zucc.

Clethraceae 230

- Clethra
 acuminata Michx.
 alnifolia L.

Compositae 280

- Baccharis
 halimifolia L.
- Iva
 *oraria Bartlett

Cornaceae 229

- Cornus
 *alternifolia L.
 *Amomum Mill.
 australis C. A. Mey.
 *canadensis L.
 *florida L.
 gracilis Koehne
 kousa Buerger.
 *racemosa Lam.

Dilleniaceae 180

- Actinidia
 arguta Miq.

Ebenaceae 240

- Diospyros
 *virginiana L.

Elaeagnaceae 215

- Elaeagnus
 umbellata Thunb.

Ericaceae 233

- Chamaedaphne
 *calyculata (L.) Moench.
- Enkianthus
 campanulatus Nichols
 perulatus Schneid.
 subsessilis Mak.
- Gaultheria
 *procumbens L.
- Oxydendrum
 arboreum DC.
- Xolisma
 *ligustrina Britt.
- Zenobia
 pulverulenta Pollard

Ericaceae**Vaccinoideae 233a**

- Gaylussacia
 *dumosa Torr. & Gr.
- Vaccinium
 *atrococcum Heller
 *canadense Kalm
 ciliatum Thunb.
 *corymbosum L.

Euphorbiaceae 147

- Sapium
 sebiferum Roxb.
- Securinega
 flueggeoides Muell.

Fagaceae 62

- Castanea
 pumila Mill.
- Quercus
 *marilandica Muenchh.

- Grossulariaceae 117b**
 Ribes
 aureum Pursh
 odoratum Wendl.
 sativum Syme var. macro-
 carpum Bailey
 triste Pall.
- Guttiferae 187**
 Hypericum
 aureum Bartr.
 densiflorum Pursh
- Juglandaceae 60**
 Platycarya
 strobilacea Sieb. & Zucc.
- Labiatae 254**
 Elsholtzia
 Stauntonii Benth.
- Lauraceae 102**
 Benzoin
 *aestivale Nees
- Leguminosae**
Caesalpinioideae 127b
 Gleditsia
 triacanthos L.
 Gymnocladus
 dioeca K. Koch
- Leguminosae 128**
 Acacia
 Kettlewelliae Maiden
 Amorpha
 canescens Nutt.
 glabra Poir.
 virgata Small
 Caragana
 arborescens Lam.
- Cladrastis
 lutea K. Koch
 Cytisus
 x praecox Bean
 Indigofera
 Kirilowii Maxim.
 Maackia
 chinensis Takeda
 Robinia
 x Holdtii Beissn.
 Kelseyi Hutchins.
 neo-mexicana Gray
 Pseudoacacia L.
- Lythraceae 216**
 Lagerstroemia
 indica L.
- Magnoliaceae 95**
 Liriodendron
 *Tulipifera L.
- Malvaceae 175**
 Hibiscus
 syriacus L.
- Menispermaceae 94**
 Menispermum
 canadense L.
- Moraceae 64**
 Maclura
 pomifera Schneid.
- Myricaceae 57**
 Myrica
 *caroliniensis Mill.
 *Gale L.
- Myrtaceae 222**
 Eucalyptus
 Dalrympleana Maiden
 gigantea Dehnh.

oreades R. T. Baker
 pauciflora Sieber
 radiata Sieber

Oleaceae 243

Chionanthus
 virginica L.
 Fontanesia
 Fortunei Carr.
 Fraxinus
 longicuspis Sieb. & Zucc.
 Ligustrum
 acuminatum Koehne var.
 macrocarpum Schn.
 x ibolium Coe
 obtusifolium Sieb. & Zucc.

Pittosporaceae 118

Pittosporum
 Tobira Ait.

Plantaginaceae 269

Plantago
 Cynops L.

Polygonaceae 77

Polygonum
 Aubertii L.

Ranunculaceae 91

Clematis
 *virginiana L.
 Zanthorhiza
 apiifolia L'Hérit.

Rhamnaceae 169

Ceanothus
 *americanus L.
 Rhamnus
 Frangula L.

Rosaceae 126

Exochorda
 Giraldii Hesse var. Wil-
 sonii Rehd.
 Korolkowii Lav.

Potentilla
 fruticosa L.

Rosa
 *carolina L.

Sorbaria
 Aitchisonii Hemsl.
 sorbifolia A. Br.

Spiraea
 Billiardii Herincq
 chamaedryfolia L.
 japonica L.
 x Margaritae Zabel
 *tomentosa L.

Rosaceae

Pomoideae 126a

Aronia
 arbutifolia L.
 *melanocarpa Elliott
 melanocarpa var. elata
 Rehd.
 Cotoneaster
 bullata Bois. var. floribunda
 Rehd. & Wils.
 horizontalis Decne.
 Malus
 baccata Borkh.
 Photinia
 serrulata Lindl.
 villosa DC.
 Sorbus
 *americana Marsh.
 Stranvaesia
 Davidiana Decne.

Rosaceae

Prunoideae 126b

Prunus
 *maritima Marsh.
 *serotina Ehrh.
 *virginiana L.

Rubiaceae 270

Cephalanthus
 *occidentalis L.

Rutaceae 137

- Evodia*
 Daniellii Hemsl.
 hupehensis Dode
Phellodendron
 chinense Schneid.
 japonicum Thunb.
 Lavallei Dode
Ptelea
 isophylla Greene
 serrata Small
Zanthoxylum
 americanum Mill.

Saxifragaceae 117

- Hydrangea*
 cinerea Small
 paniculata Sieb.
 petiolaris Sieb. & Zucc.
Itea
 virginica L.

Staphyleaceae 161

- Staphylea*
 humalda DC.
 **trifolia* L.

Sterculiaceae 178

- Firmiana*
 simplex W. F. Wight

Styracaceae 242

- Halesia*
 carolina L.
Pterostyrax
 hispidus Sieb. & Zucc.
Styrax
 japonica Sieb. & Zucc.

Ulmaceae 63

- Celtis*
 **occidentalis* L.

Vitaceae 170

- Parthenocissus*
 **quinquefolia* Planch.
Vitis
 **aestivalis* Michx.

MONOCOTYLEDONES**Liliaceae 338**

- Smilax*
 **glauca* Walt.

SEEDS OF HERBACEOUS PLANTS**DICOTYLEDONES****Amarantaceae 79**

- Alternanthera*
 sessilis R. Br.
Celosia
 argentea L.
 argentea chrysanthiflora
 argentea Thompsoni

- cristata* L.
Froelichia
 floridana Moq.
 gracilis Moq.
Gomphrena
 globosa L.
 globosa var. *carnea*

Araliaceae 227

- Aralia
 *hispidula Vent.
 *nudicaulis L.

Capparidaceae 107

- Cleome
 graveolens Raf. var.
 violacea
 spinosa Jacq.

Compositae 280

- Ageratum
 Houstonianum Mill.
 Chrysanthemum
 Parthenium Pers.
 Parthenium var. "Golden
 Ball"
 Parthenium var. "Silver
 Ball"
 Erigeron
 macranthus Nutt.
 Helichrysum
 bracteatum Andr.
 Tagetes
 lucida Cav.
 patula L.
 Zinnia
 multiflora L.

Droseraceae 112

- Dionaea
 *muscipula Ellis
 Drosera
 *filiformis Raf.
 *rotundifolia L.

Euphorbiaceae 147

- Euphorbia
 marginata Pursh
 Ricinus
 communis L.

Labiatae 254

- Perilla
 nankinensis Bailey
 Salvia
 Sclarea L.

Leguminosae 128

- Dolichos
 Lablab L.

Lobeliaceae 276a

- Lobelia
 *Dortmanna L.
 tenuior R. Br.

Malvaceae 175

- Hibiscus
 militaris Cav.
 Moscheutos L.

Nymphaeaceae 88

- Nymphaea
 ampla
 August Koch
 Bisset
 Blue Bird
 caerulea
 capensis var. zanzibariensis
 capensis var. zanzibariensis
 rosea
 Col. Lindbergh
 dentata var. superba
 Emily Grant Hutchings
 George Huster
 Gov. Emerson
 H. C. Haastick
 Henry Shaw
 Hofgartner Grabner
 Independence Pink
 Janice
 Jupiter
 kewensis
 marmorata

- Minerva
 Mrs. C. W. Ward
 Mrs. E. D. Whittaker
 Mrs. G. C. Hitchcock
 O'Mara
 Panama Pacific
 Pink Pearl
 R. A. Harper
 Stella Gurney
 Sturtevant
- Polemoniaceae 250**
- Phlox
 Drummondi Hook.
 (salmon pink)
- Portulacaceae 85**
- Talinum
 patens Willd.
- Ranunculaceae 91**
- Coptis
 groenlandica (Oeder)
 Fern. (C. trifolia of
 auth.)
- Scrophulariaceae 257**
- Antirrhinum
 majus L.
- Solanaceae 256**
- Nicotiana
 Sanderae "Crimson King"
- Verbenaceae 253**
- Verbena
 venosa Gill. & Hook.
- Violaceae 198**
- Viola
 *lanceolata L.
- MONOCOTYLEDONES
- Alismaceae 315**
- Alisma
 *subcordatum Raf.
 sinensis var. gracillimus
 Hitchc.
 sinensis var. zebrinus Beal
- Dioscoreaceae 343**
- Dioscorea
 *villosa L.
- Eriocaulaceae 330**
- Eriocaulon
 *articulatum (Huds.) Mor-
 ong.
- Gramineae 319**
- Arundo
 Donax L.
 Miscanthus
 sinensis Anderss.
- Liliaceae 338**
- Clintonia
 *borealis (Ait.) Raf.
- Lilium
 philippinense Baker
- Maianthemum
 *canadense Desf.
- Medeola
 *virginiana L.
- Polygonatum
 *biflorum (Walt.) Ell.
- Trillium
 *undulatum Willd.
- Uvularia
 *perfoliata L.

SEEDS FROM IDAHO

Collected by Mr. F. B. Wood,
Woodacres, P. O. Box 675, Boise, Idaho

Allium	Mimulus
cernuum Roth.	Lewisii Pursh
Antennaria	Pentstemon
rosea (Eat.) Greene	Cardwellii Howell
Calochortus	confertus Dougl.
macrocarpus Dougl.	Rattanii Gray
Camassia	Phacelia
Leichtlinii (Baker) Wats.	sericea (Graham) Gray
Castilleja	Phlox
(red)	longifolia Nutt.
Delphinium	Potentilla
bicolor Nutt.	villosa Pall.
Menziesii DC.	Romanzoffia
Epilobium	sitchensis Bong.
(yellow)	Saxifraga
Erigeron	caespitosa L.
compositus trifidus	Silene
(Hook.) Gray	acaulis L.
Erythronium	Specularia
(white)	perfoliata L.
Fritillaria	Synthyris
lanceolata Pursh	reniformis Benth.
pudica (Pursh) Spreng.	Trollius
Lupinus	albiflorus Rydb.
(yellow)	

Requests for seeds should reach us by March first at the latest
Address:

SEED EXCHANGE,
Brooklyn Botanic Garden,
1000 Washington Avenue,
Brooklyn, N. Y.,
U. S. A

INTERNATIONAL SEED EXCHANGE

We include with this seed list a map indicating 135 European botanic gardens from which we have received seed lists in recent years. Another year we plan to include a map showing botanic gardens in other continents.

We would be glad to receive additions or corrections.

In the "Guide Illustré du Jardin Botanique de Dijon," 1925, M. Genty writes of "the too laconic and ephemeral influence of the annual seed-exchange catalogs," and envisages for the future "some sort of international federation among botanic gardens, which could not but have happy results for science and for world peace."

At present botanic gardens are largely regional and national. Many French gardens are laid out on the DeCandolle or Brongniart systems, British gardens on the Bentham and Hooker system, and German gardens on the Engler system. These differences are more or less reflected in the seed-catalogs and in the nomenclature of the various gardens.

The 1930 Cambridge Congress rejected, by about two-thirds majority, the proposal for "*nomina specifica conservanda*." Will botanic gardens, then, change long established names such as *Pinus excelsa*, *Araucaria imbricata*, *Sequoia gigantea*, *Ananas sativus* and others? Are such changes desirable and necessary?—A. G.

THE BOTANIC GARDEN AND THE CITY

THE BROOKLYN BOTANIC GARDEN, established in 1910, is a Department of the Brooklyn Institute of Arts and Sciences. It is supported in part by municipal appropriations, and in part by private funds, including income from endowment, membership dues, and special contributions. Its articulation with the City is through the Department of Parks.

The City owns the land devoted to Garden purposes, builds, lights, and heats the buildings, and keeps them in repair, and includes in its annual tax budget an appropriation for other items of maintenance. One third of the cost of the present buildings (about \$300,000) and of other permanent improvements (about \$253,000) has been met from private funds.

Appointments to all positions are made by the director of the Garden, with the approval of the Botanic Garden Governing Committee, and all authorized expenditures for maintenance are made in the name of the private organization, from funds advanced by the Institute, which, in turn, is reimbursed from time to time by the City, within the limits, and according to the terms of the annual Tax Budget appropriation.

All plants have been purchased with private funds since the Garden was established. In addition to this, it has been the practice of the Garden, from its beginning, to purchase all books for the library, all specimens for the herbarium, all lantern slides and photographic material, and numerous other items, and to pay certain salaries, with private funds.

The needs of the Garden for private funds for all purposes, are more than twice as great as the present income from endowment, membership dues, and special contributions. The director of the Garden will be glad to give full information as to possible uses of such funds to any who may be interested.

INFORMATION CONCERNING MEMBERSHIP

The Brooklyn Institute of Arts and Sciences is organized in three main departments: 1. The Department of Education. 2. The Museums. 3. The Botanic Garden.

Any of the following seven classes of membership may be taken out through the Botanic Garden:

1. Annual member	\$ 10
2. Sustaining member	25
3. Life member	500
4. Permanent member	2,500
5. Donor	10,000
6. Patron	25,000
7. Benefactor	100,000

Sustaining members are annual members with full privileges in Departments one to three. Membership in classes two to seven carries full privileges in Departments one to three.

In addition to opportunities afforded to members of the Botanic Garden for public service through cooperating in its development, and helping to further its aims to advance and diffuse a knowledge and love of plants, to help preserve our native wild flowers, and to afford additional and much needed educational advantages in Brooklyn and Greater New York, members may also enjoy the privileges indicated on the following page.

Further information concerning membership may be had by addressing The Director, Brooklyn Botanic Garden, Brooklyn, N. Y., or by personal conference by appointment. Telephone, Prospect 9-6173.

PRIVILEGES OF MEMBERSHIP

1. Free admission to the buildings and grounds at all times.
2. Cards of admission for self and friends to all exhibitions and openings preceding the admission of the general public, and to receptions.
3. Services of docent (by appointment), for self and party (of not less than six), when visiting the Garden.
4. Admission of member and one guest to field trips and other scientific meetings under Garden auspices, at the Garden or elsewhere.
5. Free tuition in most courses of instruction; in other courses a liberal discount from the fee charged to non-members.
6. Invitations for self and friends to spring and fall "Flower Days," and to the Annual Spring Inspection.
7. Copies of Garden publications, as follows:
 - a. RECORD (including the ANNUAL REPORT).
 - b. GUIDES (to the Plantations and Collections).
 - c. LEAFLETS (of popular information).
 - d. CONTRIBUTIONS (on request. Technical papers).
8. Announcement Cards (Post Card Bulletins) concerning plants in flower and other items of interest.
9. Privileges of the Library and of the Herbarium.
10. Expert advice on the choice and care of ornamental trees, shrubs, and herbaceous plants, indoors and out; on planting the home grounds; the care of lawns; and the treatment of plants affected by insect and fungous pests.
11. Determination of botanical specimens.
12. Participation in the periodical distribution of surplus plant material and seeds, in accordance with special announcements sent to members from time to time.
13. Membership privileges in other botanic gardens and museums outside of Greater New York, when visiting other cities, and on presentation of membership card in Brooklyn Botanic Garden.

FORMS OF BEQUEST TO THE BROOKLYN BOTANIC GARDEN

Form of Bequest for General Purposes

I hereby give, devise, and bequeath to The Brooklyn Institute of Arts and Sciences, Brooklyn, N. Y., the sum ofDollars, the income from which said sum to be used for the educational and scientific work of the Brooklyn Botanic Garden.

Form of Bequest for a Curatorship

I hereby give, devise, and bequeath to The Brooklyn Institute of Arts and Sciences, Brooklyn, N. Y., the sum of.....Dollars, as an endowment for a curatorship in the Brooklyn Botanic Garden, the income from which sum to be used each year towards the payment of the salary of a curator in said Botanic Garden, to be known as the (here may be inserted the name of the donor or other person) curatorship.

Form of Bequest for a Fellowship

I hereby give, devise, and bequeath to The Brooklyn Institute of Arts and Sciences, Brooklyn, N. Y., the sum of.....Dollars, the income from which sum to be used in the payment of a fellowship for advanced botanical investigation in the Brooklyn Botanic Garden, to be known as thefellowship.

Form of Bequest for other particular purposes designated by the testator

I hereby give, devise, and bequeath to The Brooklyn Institute of Arts and Sciences, Brooklyn, N. Y., the sum of..... Dollars, to be used (or the income from which to be used) for the Brooklyn Botanic Garden *

* The following additional purposes are suggested for which endowment is needed:

1. Botanical research.
2. Publishing the results of botanical investigations.
3. Popular botanical publication.
4. The endowment of a lectureship, or a lecture course.
5. Botanical illustrations for publications and lectures.
6. The purchase and collecting of plants.
7. The beautifying of the grounds.
8. The purchase of publications for the library.
9. Extending and enriching our work of public education.
10. The establishing of prizes to be awarded by the Brooklyn Botanic Garden for botanical research, or for superior excellence of botanical work in the High Schools of the City of New York.



FIG. 1. Japanese Garden showing clipped Flowering Crab (*Malus floribunda*) in full bloom. May 7, 1934 (8579)

BROOKLYN BOTANIC GARDEN RECORD

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TWENTY-FOURTH ANNUAL REPORT

OF THE

BROOKLYN BOTANIC GARDEN

1934

REPORT OF THE DIRECTOR

TO THE BOTANIC GARDEN GOVERNING COMMITTEE

I have the honor to present herewith the Twenty-fourth Annual Report of the Brooklyn Botanic Garden for the year 1934.

COOPERATION IN RECOVERY PROGRAMS

At the close of the Peloponnesian wars, about the middle of the fifth century B C, Athens was suffering from post-war unemployment—a condition analogous to that which is almost universal now. To meet the situation, Pericles proposed a vast program of public works to be financed with government funds. These included the building of the Parthenon, and gave work and income, not only to day laborers and artisans, but also to architects and sculptors, including Ictinus, who designed the structure, and the famous Phidias, who supervised the work. According to Plutarch, every craft and industry was involved. We are told that hundreds of workmen, skilled and unskilled, including labor in transportation of materials, were employed for ten years or more on the Parthenon alone.

The historical account reads like a page from a metropolitan newspaper of 1933-34. It was the CWA of classic Greece. We may question the desirability of such a program of state socialism

extending over a period of more than ten years. But the beautification of Athens, with all it has meant to modern civilization, must be considered as some compensation (from our point of view, at least) for the distresses of the post-war "depression" in Athens.

The recalling of this history enables us to view, in illuminating perspective, the current events of our own time under the operation of the Civil Works Administration (CWA), Temporary Emergency Relief Administration (TERA), Public Works of Art Project (PWAP), and other "Administrations" of the "recovery" program, enriching our cities with works of engineering and of architectural and landscape beauty.

The Brooklyn Botanic Garden has benefited in various ways by cooperation with different governmental recovery projects, as follows:

EWB (Emergency Work Bureau).—Our cooperation with this Bureau during 1932 and 1933 has been recorded in the Annual Reports for those years. During 1934 a total of 11 men and 20 women have been employed in what is commonly referred to as "white collar" work in the library, herbarium, business office, and various curatorial departments. Some of the details of work accomplished are recorded in the appended departmental reports.

CWA (Civil Works Administration).—The most extensive and important project at the Garden under this bureau has been the completion of the grading, top-soiling, and most of the construction work on the North Addition, bringing it to a condition ready for planting by our regular gardening force.

The landscaping plan, by Mr. Harold A. Caparn, has had the approval of the Botanic Garden Governing Committee and the Art Commission of New York City.

The beginning of this project is recorded in detail in the *Report* for 1933, and need not be repeated here. The actual work began on February 5, 1934, when the soil was frozen to a depth of eight or ten inches or more, and snow was on the ground. It was difficult to work under such handicaps, with temperatures often below zero. However, men were being given work and wages, and the operations progressed more satisfactorily as spring advanced.

Everything possible was done by hand, even where machine tools would have made far more rapid progress. The landscape architect's perspective view of the ideal toward which we are working in this development was shown as the frontispiece of the 1933 Annual Report.

The project, supervised by Mr. Caparn, was under the general supervision of the office of the Borough Engineer, Mr. Frank J. Lynch.

The Garden is under obligations to Borough Engineer Lynch and his staff, and to Park Commissioner Moses and his staff, including Mr. F. H. Gross, Borough Director for Brooklyn. It is a pleasure to express here our appreciation of their cooperation.

The area is now ready for planting, except for the erection of four stone pillars for each of ten pergolas. The order for these pillars was placed before the end of the year and their delivery and erection are expected early in 1935. The area, when planted, will be known as the "Horticultural Section."

Wall Garden.—An important feature of the "Horticultural Section" will be the Wall Garden, begun and completed ready for planting in 1934. This feature lies against the Mt. Prospect Reservoir embankment, on the west side. It was necessary to build against this embankment a reinforced concrete wall (Fig. 2). In front of this the wall-garden wall was constructed partly of roughly rectangular stone blocks, and partly of glacial boulders, properly laid and with an abundance of topsoil between the stones and between the concrete wall and the outer wall. So far as we can ascertain, this, when completed, will be the only example of a wall garden in a public park or garden in America. Its total length is 385 feet.

Administratively, we must realize that an area, like the North Addition, of between three and four acres, intensively developed, will require the entire time of several men, including skilled gardeners, to care for it properly. When its planting has matured, it will be one of the most beautiful approaches to a public garden.

This development also makes it increasingly urgent that the entrance gate at Eastern Parkway be built as soon as possible. The architect's design for this gate has had the approval of the



Fig 2 North Addition development Wall-garden wall against Reservoir embankment, showing reinforced concrete retaining wall against which the stone planting-wall is being built Facing south-west June 14, 1934 (8606)

Botanic Garden Governing Committee and the Municipal Art Commission The architects are McKim, Mead and White

CWA-TERA Project—Beginning as of May 1, the CWA "white collar" work was continued under the Temporary Emergency Relief Administration The initial set-up was as follows

TERA Project 89-Fd-374-X

To enable the Brooklyn Botanic Garden to recruit its staff so as to more effectively serve the public and to take care of necessary work which could not otherwise be done. The set-up was as follows

	Clerks	Stenog	Lab Asst	Lab Asst	Trans-lator	Drafts-man	Attend-ants	Photo Asst.	Totals
Director	1	1							2
Secretary	1								1
Elementary Inst'n	5								5
Public Instruction	3								3
Research				1	1				2
Herbarium	2			1	1	1			5
Horticulture							2		2
Membership		1							1
Custodian	1						3		4
Library	1		1						2
Photography								1	1
Totals	14	2	1	2	2	1	5	1	28

As of December 31, 1934, the set-up was as follows:

	Clerks	Stenog.	Lab Asst.	Trans-lator	Attend-ants	Totals
Director	1					1
Secretary	1					1
Elementary Inst'n	3					3
Public Instruction	2					2
Research			1			1
Herbarium ...	1		1	1		3
Horticulture					2	2
Membership		1				1
Custodian	2				3	5
Totals	10	1	2	1	5	19

It is a pleasure to report that the men and women assigned to this Project have not been engaged in so-called "made" work,



FIG. 3. Busts of botanists. Plaster models for casting in bronze, by Public Works of Art Project sculptors. Top: John Torrey (left), Asa Gray. Middle: Robert Brown (left), Gregor Mendel. Bottom: Darwin (left), Linnaeus.

but have been temporarily occupying positions which would be filled by permanent appointments if the Botanic Garden had sufficient funds. For the most part, the work has been of the nature commonly understood by the titles of the different positions

PWAP (Public Works of Art Project).—"Provision for the encouragement of the fine arts has always been recognized as one of the functions of the Federal Government, and it is obvious that such provisions should be enlarged in time of depression. . . . We plan to find opportunities for this work in the embellishment of Federal Buildings with murals, sculpture, and craftsmanship, in similar work on state and municipal buildings financed by the Federal Government, and in other directions where the opportunity develops. . . . We realize the encouragement of art is a vital factor in our civilization." The quotation is from a statement issued in November, 1933, by Mr. L. W. Robert, Jr., Assistant Secretary of the Treasury.

In February, 1934, the Brooklyn Botanic Garden was asked if it had any art work that could be undertaken under the PWAP. Two projects were submitted and accepted, as follows:

a. Six Busts of Botanists.—The following subjects were chosen on the basis of the importance of their work, their local or national importance, and the availability of material (in the way of photographs, etc.) with which the sculptors could work. Six sculptors were assigned to this work, as follows:

Darwin. By Alexander Sambugnac.

Linnaeus. By Moissaye Marans.

Mendel. By Joseph D. Stott.

Asa Gray. By Guilio Novani.

Torrey. By Walter D. Plonski.

Robert Brown. By Carl L. Schmitz.

The plaster models, which have been approved by the Committee of the PWAP, were made in anticipation of being cast in bronze. In almost every case, it was difficult to get the most helpful material to work from—such as full face and profile views. Photographs of the six busts are reproduced on page 16.

b. Mural Design for the Ceiling of the Main Rotunda of the

Laboratory Building.—It was the original intention of the architects of this building (McKim, Mead and White) that the rotunda ceiling should some day be decorated. The preparation of this design was assigned by the PWAP authorities to Mr. Frank H. Schwarz, a member of the National Academy of Design. His design is reproduced below.

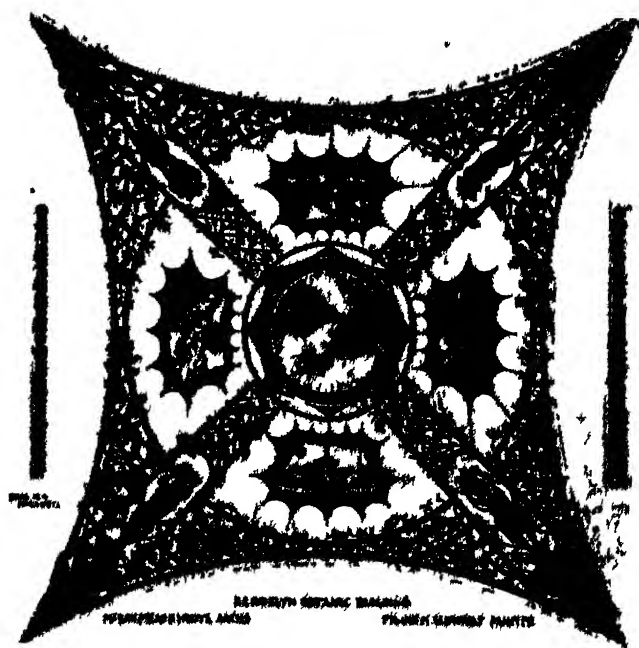


FIG. 4. Design for Mural for main floor rotunda ceiling. By Frank H. Schwarz, A. N. A. (8578)

RESEARCH

"We might just as well command the sun to stand still as to say that science should take a holiday." A recent newspaper editorial pointed out what it called the futility of continuing

scientific research with a view to more efficient crop yields and general agricultural production while, at the same time, the Agricultural Adjustment Administration (AAA) was instituting measures to reduce agricultural production. The above quotation is from Secretary of Agriculture Wallace's reply to that editorial, in which he showed, with admirable conciseness and force, that "research and adjustment march together" "Agriculture needs not less science in its production but more science in its economic life."

It was the Bishop of Ripon who, during the meeting of the British Association at Leeds, in 1927, first suggested that too much scientific investigation was in progress, and that research should take a holiday. Evidently, the Bishop lost sight of the fact that the urge to understand nature is as fundamental in some men, as the urge to art, or to business or religion, is to others. The result is pure science. It is to applied science, the utilization of the results of pure science, that modern business and commerce chiefly owe their methods, their efficiency (such as they have), and whatever measure of success they have attained. It is a truism that pure science, the pursuit of natural knowledge for its own sake, has been the chief liberalizer of the human intellect in all ages.

The research program of the Brooklyn Botanic Garden has been continued during the year 1934 along lines projected several years ago. Like every other human activity, it has been hampered by lack of adequate support, but nevertheless has made steady progress, and during 1934, as in preceding years, has made substantial contributions to our knowledge of plant life, both theoretical and practical.

The support of our project of plant disease resistance has been most generously continued, now for the 14th year. Some of the year's results have been embodied in two papers by Dr. Reed, who has also continued and extended his investigation of the botanical and horticultural problems connected with the genus *Iris*, with special attention to the Japanese iris and other beardless forms.

Dr. Svenson has continued his studies of the Local Flora, and this has also enriched the Local Flora Section of the Garden.

Some of the scientific results of Dr. Svenson's trip to the Galapagos and Cocos Islands on the Nourmahal expedition in 1930 have been brought together in a paper, the publication of which has been made possible by the pledge of a generous contribution from Mr. Vincent Astor. The paper will appear in *American Journal of Botany* for February, 1935. Dr. Svenson also reports progress (p. 70) in his studies of the complex genus *Eleocharis* and of the genus *Bidens* which includes the troublesome "Stickights" of our local flora.

Dr. Graves reports progress in his study of the chestnut-bark disease. The object of this investigation is to produce, by hybridizing, a variety of chestnut (*Castanea*) hardy in the range of the American chestnut (*C. dentata*), resistant to the chestnut-bark disease or "chestnut blight," and valuable for timber.

Dr. Gundersen reports the continuation of his study of the relationship of plant families, with emphasis on placentation (the anatomy of ovule attachment) in the Dicotyledons. Dr. Benedict, resident investigator, has continued his cultures of ferns and their study. Dr. Cheney, also resident investigator, has continued his studies of the coffee plant along new lines of both economic and scientific interest; and Mr. Doney, assistant in the department of plants, has concluded his studies of the genus *Staphylea*—shrubs of the Bladdernut Family. The results are embodied in a thesis submitted to the faculty of Columbia University in partial fulfillment of the requirements for the M. A. degree.

Three research students have been registered at the Garden during the year (p. 58).

Detailed results of all these investigations are reported more fully on pages 50-72.

Of course the great need is additional support for research in the form of permanent endowment more nearly commensurate with its scientific and economic importance, and as a fundamental function of the Botanic Garden. This objective must be kept before us until the end is attained.

PUBLIC RELATIONS

Attendance.—Turnstiles at the entrance gates registered a total attendance of 1,352,407, equal to almost half the population of

Brooklyn. As stated above, the increase over 1933 was 36,560.

The largest monthly attendance was 221,780 in May, and the smallest 46,663 in February. The largest weekend attendance was 23,071 on April 7-9. These figures are less than the maximum weekend attendance in 1933, owing chiefly, no doubt, to the fact that the Eastern Parkway gate was out of commission most of the year on account of grading operations on the North Addition.

Attendance from Out of Town.—Visits to the Garden by Garden Clubs and other organizations from other cities is now a commonplace, but special trips to Brooklyn from a distance by individuals for the express purpose of visiting the Garden rarely come to our notice. It was a real pleasure to receive last June a letter from a correspondent in California, not known personally, and formerly residing in Rochester, N. Y., reading as follows: "In other days my husband and I often took a night train for New York for one day in the Botanic Garden, especially in spring . . . so I thank you for inspiration that you are unconsciously giving to an unknown person."

Attraction of Cherry Trees.—One of the New York daily papers of May 15 carried an interview with the Captain in charge of the Telegraph Bureau of the Police Department in Brooklyn. The Captain is quoted as follows: ". . . right now we are receiving hundreds of calls from all parts of Manhattan and the Bronx asking directions to the Brooklyn Botanic Garden, where the Japanese cherry trees are now in blossom."

Bureau of Public Information.—Inquiries from the general public, outside the regular Garden membership, for information on all aspects of plant life and gardening, continue to be received in increasing number from individuals and institutions, from many states from coast to coast, and from many foreign countries.

PUBLIC EDUCATION

In his Presidential Address before the British Association for the Advancement of Science in 1933 Sir Frederick Gowland Hopkins said: "It is, however, because of its extreme importance for social progress that public ignorance of biology is especially to be regretted."

This is true with reference to the great liberalizing generaliza-

tions of biology such as biogenesis, evolution, the principles of heredity, the germ theory of disease. It is equally true with reference to ignorance of the facts of plant and animal life, including matters of crop-production, sanitation, hygiene, and public health. This is not to say that everyone should become an authority on some branch of biology, but that a general sympathetic interest in, and intelligent comprehension of, the main facts and principles of botanical and zoological science is of the highest social importance. The educational work of the Brooklyn Botanic Garden has been organized in recognition of this truth.

"Effectiveness Ratio" of our Educational Contacts.

A survey of the educational activities of forty-seven American museums has been made by Mr. Edmund Cooke, of the department of Education, Cleveland Museum of Natural History. His report, published in the *Museum News* for June 1, 1934, notes that, "Practically without exception museums are endeavoring to make their influence felt in the great public task of education . . . the museums have expanded and elaborated their educational activities to a greater extent than they have any other of their departments of work."

The "effectiveness ratio," or ratio of educational contacts to city population, for 31 museums located in both "large" and "small" cities (cities of over and under 250,000 population) varied from 5% to 265%, with the median at 12.6%. "This extreme variation is no doubt due, to some extent, to differences in accounting practices, but the writer does not believe that factor is large. More important is the fact that museums strive in different degrees to reach a large proportion of their constituency. They differ in resources, energy, and most of all in their conception of what their educational mission is. *Moreover, a very large city becomes in itself an obstacle to the fulfillment of that mission, however energetic the museum staff may be.*"

The author then refers to graphs showing that the median for the "small" city group is 18.4, while that for the "large" city group is only 7.9. We comment, in this connection, that most of our educationally aggressive museums are in "large" cities; this fact emphasizes the author's deduction that the very size of a

city may be an obstacle to its educational "effectiveness," quantitatively expressed.

For the Brooklyn Botanic Garden the "effectiveness," or ratio of educational contacts* to population, for 1934 was 37.9%, which is thirty points above the median for "large" city groups, as found in Mr. Cooke's survey. In figuring this ratio the population of the Borough of Brooklyn only, and not that of Greater New York, was taken. The figures were $\frac{1,035,406}{2,732,301} = 37.9\%$. The ratio of *attendance* to population for 1934 was $\frac{1,352,407}{2,732,301} = 49.5\%$.

In other words, the registered attendance figures were equal to nearly one half the population of the Borough, and the *educational contacts* (number of persons directly reached by the educational activities of the staff, not counting visitors who merely viewed the exhibits on the ground and in the conservatories) exceeded one third the population figures.

As Mr. Cooke states, "It is a little fatuous to attempt to measure the effect of museum [and botanic garden] education numerically." The quantitative statement is only one criterion by which the educational work may be judged. Effectiveness, as measured by results, is left wholly out of account.

Adult Education

Perhaps the greatest benefit a school can confer on a pupil is to give him such an intellectual impetus that, after "school days" are over, he will continue to advance along educational paths and to browse in educational fields so long as he has his faculties. It is the purpose of adult education to assist in this progress. Our museums and botanic gardens constitute, at once, great opportunities and potent stimulants and guides.

* The term "educational contact," as commonly used by museums, indicates the number of individuals *known to be directly reached or influenced* by the museum's organized educational activities. Thus if a loan collection is used by a teacher with a class of 50 that is counted as 50 educational "contacts." Theoretically, every visitor represents an educational contact, but actually mere attendance should not be so regarded, because the varied and often educationally irrelevant motives back of attendance are clearly recognized.

During 1934 twenty-two courses of instruction for adults have been given at the Garden with a total enrollment of 927 men and women. If we were to report this after the more usual method of museums, the statement would be that 329 lectures were given.

Broadcasting.—During the year 46 radio talks were broadcast, as follows: 15 over station WOR; 31 over WNYC.

Juvenile and Children's Work

Eleven courses, announced in the *Prospectus*, for boys and girls of high school and elementary school age were given in 1934. The enrollment was 725. Again following the common museum practice, there were 319 lectures with a total attendance of 46,383. In addition, 46 courses of six to eight sessions each were given by special arrangement with school principals, as announced in the *Prospectus*. Thus, more than 648 lectures have been given during the year. The total enrollment in courses was 1661.

Fun with the Microscope.—One of the great advantages of museums, not afforded by schools, is the opportunity they give, especially to young people, to browse. In the bird room of a museum, for example, there are found within four walls, easily and quickly accessible, opportunities which nature affords only at the effort and cost of long and expensive journeys to foreign lands. The zoological park affords even better opportunities of a similar sort. The plantations and conservatories of a botanic garden enable one, within limits, of course, to see the macroscopic plant world without the time and expense of long journeys. One may thus follow his own interest and enthusiasms—may come again as often as he likes. This process has transformed many a boy and girl into an enthusiastic student or even a great scientist. It was looking through a street-corner telescope, at the price of a nickel, that transformed a certain small boy into the great astronomer, Simon Newcombe.

It was with such thoughts in mind that we decided to offer an opportunity to older boys and girls to browse with the microscope. There is a whole world of life too small to be seen with the naked eye and, therefore, wholly unknown to most people. Moreover, the microscope makes fascinating revelations as to the finer details of structure of macroscopic objects—leaf hairs,

why the petals of flowers are velvety, how the tulip gets its color, etc., etc. Few schools have time or opportunity for such work as this, for everything must be directed toward the final examination. This work, called "Fun with the microscope" was offered for the first time in 1934 to a limited number of boys and girls as a special privilege or reward for having done work of superior merit in our other children's courses. The curator of elementary instruction reports that it was a great success from the standpoint of enthusiastic response and interest.

School Standards Raised by Botanic Garden Cooperation.—In his annual report to the City Superintendent of Schools, Mr. Emmanuel F. Van Dam, district superintendent for districts 25-27, Brooklyn, stressed the importance of proper environment in reducing the percentage of juvenile delinquency. Citing the unfavorable conditions in certain districts where the percentage is high, Mr. Van Dam continued:

"In contrast to these conditions are the districts of P. S. 138, 241, and 167 in the Eastern Parkway section. . . . The Brooklyn Botanic Garden, the Brooklyn Children's Museum, and Prospect Park, near by, afford opportunities for the enrichment of the curriculum. *In consequence, the academic standards and achievements of these schools are of the highest.*"

THE LIBRARY

"A monastery without a library [*armarium*] is like a castle without an armory [*armamentarium*]," was a current aphorism of the Middle Ages. To say that a library is equally indispensable to a botanic garden (as indeed to any scientific or educational institution) would be only to state a truism. But in the medieval monasteries the books for the library were largely made on the spot by unpaid monks in the scriptorium. Some books were obtained by exchange or gift.

While modern libraries are continually enriched by gifts and bequests, they are chiefly dependent on purchases. Here, as in other departments of an institution, the ideal condition is an endowment fund to insure a permanent annual income.

STATISTICS OF SCHOOL SERVICE

	1934	1933
<i>Conferences with Teachers</i>		
No. of Conferences.....	93	127
No. of teachers involved.....	1,856	9,094
No. of pupils involved.....	84,100	209,000
<i>Loan Lectures (Lantern Slides, etc.)</i>		
No. of sets lent.....	39	38
No. of teachers involved.....	249	379
No. of pupils attending.....	13,573	19,034
<i>Material Supplied</i>		
Total number of requests from schools.....	474	609
Number of different institutions.....	204	196
High Schools and H. S. Annexes		
Brooklyn (Total No. 43).....	21	28
Queens (Total No. 23).....	7	9
Manhattan (Total No. 33).....	8	13
Other Boroughs (Total No. 22).....	6	9
Junior High Schools (Total in Brooklyn 22).....	12	19
Colleges and Universities (Total in Brooklyn 7) ..	6	11
Elementary		
Brooklyn (Total No. 223).....	84	60
Queens (Total No. 162).....	4	3
Manhattan (Total No. 132).....	2	3
Other Boroughs (Total No. 147).....	3	2
Private and Parochial.....	24	19
Other Institutions.....	27	20
Number of potted plants for nature study.....	3,768	2,793
Number of Petri dishes filled with sterilized agar.....	1,154	4,858
Total number of teachers supplied with material.....	4,733	5,150
Total number of pupils reached.....	238,916	243,607
<i>Living Plants Placed in School Rooms</i>		
No. of schools.....	24	74
No. of plants.....	181	608
No. of teachers involved.....	221	756
No. of pupils reached.....	7,550	31,744
<i>Plants Distributed (Raised in Classes)</i>	28,479	21,764
No. of persons taking plants.....	1,297	1,202
Total number of schools represented.....	153	129
<i>Seed Packets for Children</i>		
No. of schools.....	581	381
No. of teachers.....	7,094	5,365
No. of pupils.....	283,732	214,395
No. of packets.....	851,115	643,178
<i>Exhibits Provided</i>		
No. of exhibits.....	22	21
Viewed by.....	93,730	550,085

Of the modest endowment of the Brooklyn Botanic Garden, only \$23,917 has been specially designated for the Library, yielding an income in 1934 of only \$1,250.30. This amount has been supplemented by \$2,056.76 from other sources; but the small total amount available for publications in 1934 (\$2,748.21) has made it necessary to forego the purchase of many essential publications, has made it impossible to take advantage of many real bargains in old and rare classics (important for us), and has provided for only a very small percentage of the binding that accumulates from year to year.

Notwithstanding this, the library has increased by 619 volumes, 644 pamphlets, and 5,366 parts of publications, obtained by gift, exchange, and publication, as well as by purchase, as reported on page 109. The library is now receiving 1,000 current periodicals, lacking three.

The number of users (4,200) was greater than for any previous year since the Garden was established. Compared to public library data these figures are, of course, not impressive, but it must be kept in mind that ours is a highly specialized library, restricted to reference. Its importance is determined by the character and quality of its service and not by quantitative results. Students and investigators are now continually finding in the Brooklyn Botanic Garden Library items they had searched for in vain in other accessible collections.

ALS of Robert Brown.—The gift of an "autograph letter signed" of Robert Brown is noted in the report on the library (p. 103) and deserves special mention here. As every botanist knows, Robert Brown, curator of the botanical library and herbarium of the British Museum, was one of the outstanding botanists of all time. During his lifetime (1773–1858) he was designated by Humboldt as "*facile botanicorum princeps, Britanniae gloria et ornamentum.*" In addition to his contributions to systematic botany he was, as all botanists know, the first to discover and describe the nucleus as an organ of the cell. This was almost exactly one hundred years ago (in 1833).

"I know no botanical writings at all comparable to those [of Robert Brown] on morphology, taxonomy and classification, for sagacity, profundity, range of knowledge, scrupulous accuracy

and clearness. . . . Every young botanist should go through a course of reading these miscellaneous works." So wrote Sir Joseph Hooker to Sir Francis Darwin in 1888.

The gift of this letter resulted from our correspondence with Mr. James Cummings, Town Clerk of Montrose, Forfarshire, Scotland. This town is the birthplace of Robert Brown and possesses a bust of the famous botanist. Through Mr. Cummings we obtained photographs of the bust to assist Mr. Schmitz, the sculptor of our bust. As a result of our inquiry concerning the possibility of securing a letter, Mr. Cummings corresponded with the Right Hon. Lady Lyell, of London, of the family of the great English geologist, Sir Charles Lyell, and through her good offices the letter was presented to the Brooklyn Botanic Garden by its owners, Lord Lyell and Hon. Lady Langman, son and sister-in-law, respectively, of Lady Lyell. Its scientific interest and value are greatly increased by the fact that it was addressed to Sir Charles Lyell, one of the founders of modern geology.

PLANTATIONS AND GROUNDS

Flatbush-Brooklyn Patent Line

The original southern boundary of the Brooklyn Botanic Garden, was described in the Agreement of December 28, 1909, between the City of New York and the Trustees of the Brooklyn Institute of Arts and Sciences. This line coincided with the "patent line" or boundary between the old Township of Flatbush and the old City of Brooklyn. In 1909 the line was clearly indicated by an iron fence. When the so-called "South Addition," of about eight acres, was added to the Garden by the Amended Agreement of August 17, 1914, the southern boundary of the Garden was moved south to coincide with the northerly line of Malbone St., now Empire Boulevard. By the removal of the fence along the first boundary all indication of the Flatbush-Brooklyn Patent Line was obliterated within the Garden.

It seemed a matter of interest that this line should be clearly and permanently marked and, since the year 1934 is the centennial year of the incorporation of Brooklyn as a city, this seemed to be a logical time to do it. The line has been marked by a brass strip extending across the north-south paved walk on the west

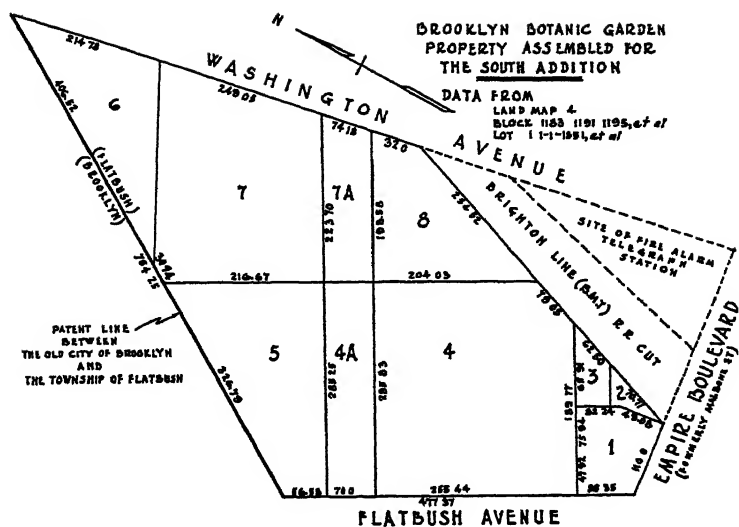


FIG. 5. Diagram of property assembled for the South Addition. (8704)

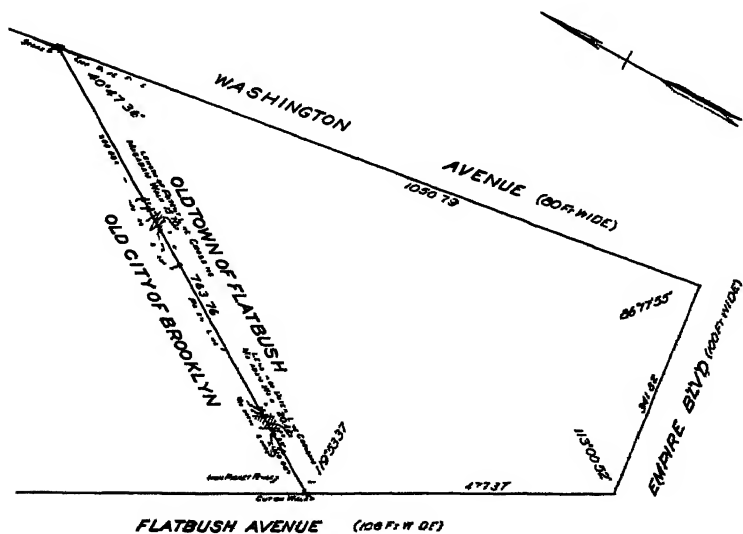


FIG. 6. Surveyor's map showing location of Patent Line between Township of Flatbush (right) and old City of Brooklyn. (8707)

side of the Garden just south of the service gate on Flatbush Ave. The brass strip is securely imbedded in a concrete panel enclosed by narrower brass strips. A bronze tablet giving pertinent data has been affixed to a glacial boulder on the west side of the walk near the end of the patent line. A photograph of the tablet is reproduced as Fig. 8.

The work was planned and the tablet designed by the consulting landscape architect Mr. Harold A. Caparn. The brass strip was set on December 20 and the bronze tablet on December 28 by the firm of John Thatcher and Son. The cost was met by contributions of members of the Garden.

The Garden is under obligations to the Department of Parks for having the line surveyed, and especially for the preliminary study of maps and records necessary in order to have the brass strip located as accurately as possible.

It is hoped that the small sum necessary to mark the patent line across the north-south walk along the east side of the Garden may become available during 1935.

Property Assembled in South Addition

Data concerning the acquisition and cost of the land comprising the South Addition are given in the Botanic Garden RECORD for November, 1932 (p. 296-298). Land Map 4 (Block 1183, 1191, 1193, 1195, et al., Lot 1-1-1-1851 et al.) gives the boundaries of the parcels assembled in the area. Figure 5 is based upon this land map. These parcels were acquired by the City by condemnation proceedings, title vested April 25, 1904. The area was assigned to the Botanic Garden (as indicated above) ten years later (1914).

Figure 6 reproduces the map prepared by the Park Department Engineer's Office in 1934, preparatory to locating the patent line where it crosses the paved walks along the west and east sides of the Garden.

Figure 7 is a reproduction of a portion of the "Map of Five Cities of New York, Brooklyn, Jersey City, Hoboken, and Hudson City. Prepared by M. Driggs for Valentines Manuel [sic] of the Corporation of the City of New York 1860." Mt. Prospect Reservoir is clearly shown in the area marked "Proposed



FIG 7 Portion of old map from Valentines "Manuel," 1860, showing site of "Proposed [Prospect] Park" and of Brooklyn Botanic Garden See text (8657)

Park," which includes much, but not all of the present Prospect Park. Eastern Parkway, not in existence in 1860, now extends along the northern edge of the Reservoir. The trapezium-shaped area in which the Reservoir is located is the old "eastside lands," and the portion of this below the Reservoir is the original area (39 + acres) of the Botanic Garden. The street along the lower right-hand side of the trapezium is approximately along the boundary between old Brooklyn (to the left) and the Township of Flatbush (to the right), and indicates roughly the locus of the patent line marked by our brass strip in the walk. Two buildings are seen located in what is now the Garden on the Flatbush Ave. side. On the opposite side, Washington Ave. (not labeled on the map) is now prolonged southward until it meets Flatbush Ave.

Spring work on the grounds began about March 29, the season being one of the latest in the history of the Garden. In 1933 Crocus Day was on March 20, while this year the Crocus were at their best on Sunday, April 8.

Winter Killing, the most severe in the history of the Garden, is noted in the report of the Horticulturist, and the damage was reported in full in the Botanic Garden RECORD for July. Many fine shrubs that had been maturing in the Garden for 18-20 years were either killed or severely injured.

North Addition developmental work has already been recorded at the beginning of this report.

Favorable Weather.—Although the middle western states, during the summer, suffered from the worst drought since the U. S. Weather Bureau was established, there was an abundance of rain in Brooklyn, fairly evenly distributed. As a result our trees, shrubs, herbaceous plants, and lawns came through the season in excellent condition so far as growth and vigor are concerned.

Plantations

Special attention is called to the appended report of the Horticulturist (p. 95) concerning the various sections of the plantations, and especially to his statement of the need of additional men. Annually, for several years, additional areas have been brought under intensive development, resulting in more lawn to mow,

more beds to cultivate, and more trees and shrubs to care for, while at the same time, the trees and shrubs planted in the earlier years have come to pruning, spraying, and other care. And yet we have had no additional gardeners and only incidental and irregular additional unskilled labor for a number of years. Of course the proper standard of maintenance cannot be realized under such a serious handicap.

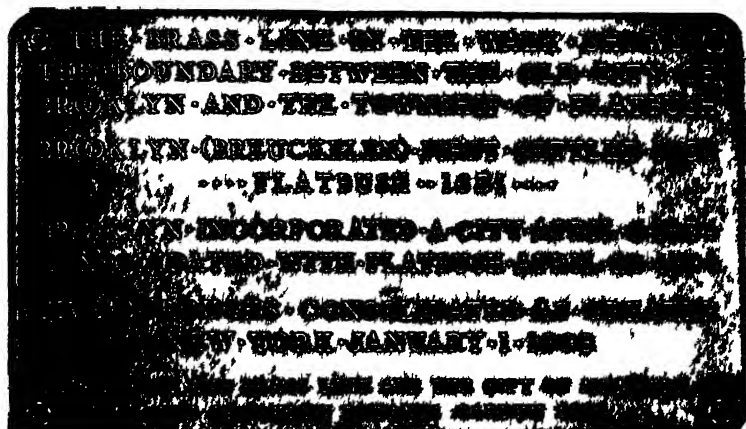


FIG 8. Bronze tablet giving data with reference to the "Patent Line" between Brooklyn and Flatbush (8647)

THE WOMAN'S AUXILIARY

Members of the Auxiliary were of great assistance at the Botanic Garden exhibit throughout the week of the International Flower Show in March, and the Auxiliary, under the continued presidency of Mrs. Charles E. Perkins, had charge as usual of the social part of the annual Spring Inspection in May. The teas at the six Flower Days and at meetings of numerous clubs were also in charge of the Auxiliary. At the annual luncheon of the Auxiliary on February 7, 140 were present, and Dr. George M. Reed gave a non-technical account of his investigations with Iris and in plant pathology.

The membership work, in charge of Mrs. Whitney Merrill, has yielded very satisfactory results for these difficult times. One

hundred and four new members of all classes have been enrolled. These, with 193 removals, make a net loss of only 89. Very few organizations and institutions have held their own in membership during the past three or four years.

The two lectures given in the Auditorium under the auspices of the Auxiliary yielded a net total of \$1650, which has been contributed to the Garden to help meet various urgent needs including the planting of the new Horticultural Section on the North Addition.

The lectures were as follows:

March 5. The miracles of nature. Mr. Arthur C. Pillsbury. Attendance, 570.

November 20. English gardens of the 17th and 18th Centuries. Mr. Gordon Dunthorne. Attendance, 600.

The Auxiliary now has 122 members. Their cooperation has been greatly appreciated.

PERSONNEL

Dr. Henry K. Svenson, assistant curator of plants (1930-1932), associate curator of plants (1933-1934), was made curator of the herbarium to begin as of January 1, 1935.

Mr. Calvin W. Foss, librarian, was absent on sick leave during the year, as last year, Mrs. Emilie Perpall Chichester serving as library assistant in charge.

Miss H. Dorothy Jenkins, A.B., instructor since April 1, 1930, resigned to take effect as of September 1, 1934.

Miss Elsie Twemlow Hammond, M.A., who was assistant curator of elementary instruction at the Garden from September 1, 1921 to April 1, 1930, was appointed instructor in place of Miss Jenkins, resigned. The appointment took effect September 1, 1934.

Miss Carleen Maley, Cornell A.B., 1933, generously volunteered her services as assistant in the Department of Elementary Instruction from October 9, 1933 until May 10, 1934, leaving to accept a regular teaching position.

Mr. Charles F. Doney, who, since December 7, 1931, has been on the per diem payroll as assistant on part time in the depart-

ment of plants, with special reference to woody plants, was appointed curatorial assistant, beginning as of January 1, 1935. From October 5 to December 7, 1931, Mr. Doney very generously gave his time without compensation.

Mr. Victor Zalewski, a member of the per diem force of the Garden for twenty-one years, was taken seriously ill November 14, the day before the organization dinner, which he was planning to attend. His illness proved fatal on November 21. Mr. Zalewski was a most faithful and highly respected employee, and will be greatly missed by all.

Mr. Andrew B. Newell, janitor since October 1, 1928, died on December 7, following a serious major operation in Kings County Hospital. "Andrew" was an efficient and loyal employee, universally liked. He, also, will be greatly missed.

Mr. Samuel J. Hague, who has been employed by the Garden, during the open season, as general guard on the grounds since May 29, 1932, was appointed janitor beginning as of December 1, in place of Andrew B. Newell, deceased.

PERSONNEL DINNER

The year 1934 marked the completion of twenty years or more of service of some eight members of the Botanic Garden personnel, as follows. The year after each name indicates the date when the appointment was made.

Members of Staff.—Miss Ellen Eddy Shaw, curator of elementary instruction (1913); Mr. Montague Free, horticulturist (1914); Dr. Alfred Gundersen, curator of plants (1914).

Other Members of Personnel.—Mr. Harold A. Caparn, consulting landscape architect (1912); John McCallum, labeler (1911); Martin Davitt, fireman (1911); John Juzwick, laborer (1913); Victor Zalewski, laborer (1913).

In recognition of these long terms of service an organization dinner was held on November 15, in the main floor rotunda of the Laboratory Building. Those present included officers of the Board of Trustees and of the Botanic Garden Governing Committee of the Board, the entire personnel of the Garden (and their wives), except three who were absent on account of illness. Appreciation of the services of each of those in the twenty-year class

was voiced by the director, and brief speeches of presentation were made by Miss Loines, Chairman of the Governing Committee. The occasion was altogether a most enjoyable one, seventy-two persons being present.

MEMBERSHIP

The membership record during the past five years of universal economic depression is about as satisfactory as could well be expected. The figures reported for membership during the past five years are as follows:

	<i>Number</i>	<i>Change</i>
1930.....	1113	-38
1931.....	1125	+12
1932.....	1231	+106
1933.....	1099	-132
1934.....	1032	-67

This encouraging record is due chiefly to the effective work of the Woman's Auxiliary, with Mrs. Whitney Merrill as membership secretary.

The needs created by a depression are physical and spiritual. Relief agencies are devoted to supplying the physical needs; they *must* be supported. Such institutions as botanic gardens minister to the spiritual needs; they *should* be supported by those able to do so. That the figures of general attendance equal almost half the population of Brooklyn, and that the figures were 36,560 in excess of 1933 leave no doubt of the fact that the public needs and wants the Botanic Garden. Membership, therefore, may be considered not only from the standpoint of personal benefit but also from that of civic opportunity.

Plant Distribution to Members, which tends to become more popular each year, is reported by the Horticulturist (p. 101).

Nine courses of instruction were offered free and one course at reduced rates.

Flower Days, primarily for members and their friends, are reported in full by the curator of public instruction (p. 76). Their popularity is reflected by the reported average attendance for the six "Days" of slightly over 237, a total of 1425.

Exchange of Membership Courtesies

By correspondence, arrangements have been made with a number of botanic gardens and museums in other cities by which officials and members of Brooklyn Botanic Garden, when visiting in those cities, may enjoy, without payment, full privileges which those institutions extend to their members. We, in turn, offer such privileges to their members when in Brooklyn. The first announcement of this plan was published in the Botanic Garden RECORD for October. To date the following 18 have authorized us to list them as cooperating institutions:

Academy of Natural Sciences, Philadelphia, Pa.
 Boston Society of Natural History, Boston, Mass.
 Buffalo Museum of Science, Buffalo, N. Y.
 Carnegie Museum, Pittsburgh, Pa.
 Charleston Museum, Charleston, S. C.
 Everhart Museum of Natural History, Science and Art, Scranton, Pa.
 Fairbanks Museum of Natural Science, St. Johnsbury, Vt.
 Field Museum of Natural History, Chicago, Ill.
 Massachusetts Horticultural Society, Boston, Mass.
 Missouri Botanic Garden, St. Louis, Mo.
 Newark Museum, Newark, N. J.
 New York State Museum, Albany, N. Y.
 Peabody Museum of Archaeology and Ethnology, Cambridge, Mass.
 Pennsylvania Horticultural Society, Philadelphia, Pa.
 Philadelphia Commercial Museum, Philadelphia, Pa.
 Southwest Museum, Los Angeles, California.
 The Berkshire Museum, Springfield, Mass.
 California Academy of Sciences, San Francisco.

TWENTIETH ANNUAL SPRING INSPECTION

The Twentieth Annual Spring Inspection was held, as usual, on the second Tuesday of May, which fell on the eighth. The attendance was approximately 800. The weather was all that could be desired, and the Woman's Auxiliary and members of the Junior League cooperated to make the social part of the Inspection an entire success.

The itinerary of the Grounds included inspection of the new Equation of Time Tablet on the Armillary Sphere, by which standard time may be calculated from the Sun Dial time; the Bronze Tablet on the north post at the entrance to the Laboratory Plaza, acknowledging the Woman's Auxiliary gift of \$1,502

for the planting of the Plaza; Cherry Walk, the trees being in full bloom but showing some injury from the unusually severe winter of 1933-34; the North Addition, showing the progress of the CWA work; and the Local Flora Section, with additional planting since the year before.

While tea was being served the following exhibits were on view:

1. Old Prints of English, French, Italian, and Dutch Gardens, about 50 in number, dating from the 17th and 18th Centuries, including the Oxford Botanic Garden in 1675 and 1733, and other Oxford gardens, exhibited by courtesy of Mr. Gordon Dunthorne, of Washington, D. C.

2. Photographs of Flowers and Gardens, about 50 in number, exhibited by courtesy of Mr. Paul S. Davis, of Boston, Massachusetts.

3. Models of Busts of Noted Botanists, referred to on page 17.

4. Design for a mural on the ceiling of the main floor rotunda of the Laboratory Building. See p. 18.

5. Two Terminal Figures—Winter and Summer. Models by Isabel Moore Kimball, sculptor. Presented to the Garden on March 6, 1934, by Miss Kimball.

6. A collection of Seeds of 100 or more native wild flowers, with paintings of the seeds and of the plants in flower. The collection and paintings were made by Mrs. Clarence R. Hyde, a member of the Woman's Auxiliary, and were exhibited by her courtesy.

COOPERATION

In addition to our cooperation with various relief administrations, special mention should be made of the following:

Department of Parks

Naming of Trees.—In ancient Rome during the period of greatest luxury, we are told that a censor deprived an elector of his vote because his garden was negligently cultivated. Mayor LaGuardia, of New York, is a modern example of a similar lively appreciation of the value of plant life in a city. Addressing the annual convention of the American Association of Nurserymen last July, the Mayor is reported to have said: "New York City has planted more trees since January 1 than any other city in the

history of the world." Asserting that we have passed the stage where flowers, trees, and parks are regarded as luxuries, he said: "They are now absolute necessities and we are going to put a tree every place in this city where we can stick one." This statement reflects the far-seeing and progressive plans and accomplishment of our efficient Commissioner of Parks, Mr. Robert Moses.

It has been a pleasure for the Brooklyn Botanic Garden to respond, through Dr. Graves, to the request of the Park Department for cooperation in naming the larger and more important trees in the City. The trees thus serve educational as well as aesthetic ends. A report of this cooperation is given by the curator of public instruction on page 79. The Garden has also acted in an advisory capacity with reference to the question of continuing, or otherwise, the conservatories in Central Park.

The Garden has advised the Engineer of the Department of Parks with reference to different species of plants for decorative planting in the parks.

Washington Avenue Sidewalk.—Owing to previous changes in grade of the roadway of Washington Ave., the sidewalk on the west side, along the Botanic Garden frontage, has for several years been below the level of the ground on either side, so that during heavy rains and especially during the melting of snow the walk became the bed of a stream, making foot traffic difficult. This condition had been pointed out to previous administrations. In June it was brought to the attention of Park Commissioner Moses. The work of regrading and relaying the walk was begun in July under the supervision of Mr. W. H. Latham, Park Engineer, and largely completed on August 24. The final grading operations were done by our own men.

Exchange of Plants.—The appended report of the Horticulturist records our supplying the Department of Parks with propagating material of different varieties of Waterlilies sufficient to make 2600 divisions or plants. These were used in the lower lake in Central Park, where the boating of former years has been discontinued by Commissioner Moses.

On October 10 we received, in exchange, from the Department,

60 potted plants and about 100 cuttings of *Sedum*. These became available in connection with the dismantling of the Central Park Conservatories, which have been discontinued and taken down.

Other Organizations

Department of Public Welfare: Works Division, New York City.—In October, the Garden responded to a request of the Engineer of the Department of Standards of this Division for an analysis of the purity and germinating power of samples of lawn grass seed submitted by various vendors in connection with bids. This we were able to do by the generous cooperation of Jessie G. Fiske, State Seed Analyst of New Jersey. The analysis took several weeks, and the report was forwarded on December 21.

New Jersey College of Agriculture Extension Service.—During 1934, for the third season, the Garden has cooperated with the Extension Work in Agriculture of this College in radio broadcasting. The U. S. Department of Agriculture is also cooperating. Mr. Free and Miss Shaw, representing the Garden, have served on the staff of broadcasters over station WOR. In this connection a Radio Garden Club has been organized, extending into Canada and the District of Columbia, and over 18 states, as follows: Maine, New Hampshire, Vermont, Massachusetts, Connecticut, New York, New Jersey, Pennsylvania, Delaware, Maryland, Virginia, West Virginia, South Carolina, Georgia, Indiana, Illinois, Michigan and Wisconsin. During 1934 the fan mail in connection with the program has amounted to 400 letters. Mr. Free has given 12 broadcasts and Miss Shaw two. These 14 broadcasts are listed, with others, on page 137.

A letter of October 3 from the station contains this statement: "We feel that the Radio Garden Club has derived a tremendous amount of benefit from its connection with the Botanic Garden, and that by working together in this fashion we have been able to offer our radio audience information of great practical value."

New Jersey State Museum, at Trenton, held an exhibit of "Plant Forms in Ornament," May 20 to June 18. At their request, the Garden loaned living plants of *Kleinia repens*, *Onoclea sensibilis*, species of *Cacti*, and *Mimosa pudica*.

United States Botanic Garden.—At the second session of the

73rd United States Congress, April 19, 1934, Congressman Kent E. Keller, Chairman of the House Committee on the Library, introduced House Joint Resolution 327, authorizing the appointment of a "Planning Committee in connection with the United States Botanic Garden, and for other purposes." Under the terms of this resolution twenty citizens, including the Director of the Brooklyn Botanic Garden, were named as members of this Committee. Under date of July 30, 1934, Congressman Frederic A. Delano, of New York nominated in the Resolution as Chairman of this Committee, addressed a communication "To the Members of the Planning Committee of the United States Botanic Garden." This communication announced the naming of the following subcommittees:

Location and Size: Chairman, Hon. Frederick A. Delano, M.C.

Scope and Function: Chairman, Mr. B. Y. Morrison, Head of the Division of Foreign Plant Introduction, Bureau of Plant Industry, Department of Agriculture.

Administration and Correlation: Chairman, Prof. H. H. Bartlett, Director of the Botanical Garden and Arboretum, University of Michigan.

Education and Public Relations: Chairman, Dr. C. Stuart Gager, Director, Brooklyn Botanic Garden.

Legislation: Chairman, Hon. Kent E. Keller, M.C.

Mr. John C. Bradley, Secretary to Congressman Keller, will serve as Vice Chairman of the Committee in the preparation of the report, in order to compile and edit the report which will be made up for deliberation by Congress.

American Rock Garden Society.—Mr. Free, the first president of this new organization, records its first annual meeting at the Brooklyn Botanic Garden in his report (p. 102).

National Rose Garden.—Mr. Free reports (p. 102) his trip to Washington to confer as member of a committee on the project to establish a National Rose Garden in the District of Columbia, possibly under the auspices of the American Rose Society.

International Flower Show.—An account of our four exhibits at the 1934 show, Grand Central Palace, is given by the horticulturist on page 99. As a result of these exhibits, we received 40 clippings of news items and editorial mention in newspapers and

in horticultural and society magazines. It is estimated that our exhibits were viewed by approximately 130,000 persons. About 7000 copies of a four-page *Leaflet* describing the exhibit, and about 2400 copies of an eight-page *Leaflet* on the subject of the main exhibit (Methods of Pruning) were distributed. Our exhibits were planned by Mr. Free and installed under his supervision. The director of the Garden continued during 1934 as a member of the International Flower Show Committee.

Horticultural Society of New York.—The director has continued, for the seventh year, to serve as a member of the Board of Trustees of this Society. Dr. Svenson, of the Garden staff, has, for the third season (since 1932), given an afternoon course of instruction at the rooms of the Society, and Mr. Free lectured before the Society on January 17.

Department of Botany of the Brooklyn Institute of Arts and Sciences.—For nine years (since October 19, 1926) this organization has held its opening fall meeting in the Laboratory Building of the Garden. By an arrangement entered into in September, 1934, the Department will hold all of its regular meetings at the Garden until further notice. Dr. Graves reports two meetings (November and December) held in 1934.

The School Garden Association of New York.—The fifth annual meeting of delegates from the thirty-six school gardens conducted by this Association during the summer in Brooklyn was held at the Botanic Garden on November 19. These delegates are now called "nature curators."

Columbia University, College of Pharmacy, held an exhibit of scientific pharmacy from May 28 to June 2. At the request of the College the Garden loaned for the exhibit 31 potted plants in eight species, one uprooted plant, and 11 cut specimens in 11 species.

New York Botanical Garden.—Dr. E. D. Merrill, director of this Garden, extended to our "unemployed" and other gardeners the courtesy of free enrollment in the courses for gardeners being given by the New York Garden at the rooms of the Horticultural Society of New York. Two of our regular employees took advantage of this opportunity.

Arthur Hoyt Scott Horticultural Foundation.—During the summer of 1934 Mr. John C. Wister, director of this Foundation,



FIG. 9. Brooklyn Fall Flower Show exhibit of the Brooklyn Botanic Garden. Sept 26, 1934. (8642)

located at Swarthmore, Pa., sent us 63 rhizomes of 29 varieties of Bearded Iris. Most of these varieties are comparatively new, and hence somewhat expensive. Mr. Wister also obtained for us 47 rhizomes of 17 varieties of Bearded Iris from Mrs. Z. G. Simmons, Greenwich, Conn. In exchange, we sent to the Scott Foundation, in March, 50 varieties of Japanese Iris and 14 varieties of Siberian Iris.

Long Island University.—In October Mr. Free, on request, visited this University and gave suggestions as to what shrubs would be best for planting in the University grounds.

Hospitals.—As during previous years, the Garden offered a course of lectures and field trips (in the plantations), with special reference to medicinal plants, to the classes of Student Nurses in three Brooklyn Hospitals—Kings County (municipal), Prospect Heights and St. John's (both private endowments). Dr. Graves reports more fully on this (p. 75).

Brooklyn Fall Flower Show.—The Garden installed a very attractive educational exhibit of cacti and other succulents at the Brooklyn Fall Flower Show, held in the 14th Regiment Armory September 25–29. In this connection printed matter concerning the Garden was distributed. At the close of the show the authorities presented to the Garden 100 Cedar trees suitable for poles. Mr. William T. Hunter, member of the Botanic Garden Governing Committee, kindly placed at our disposal a truck of his firm (A. Schrader's Son, Inc.) to bring the trees and the exhibits back to the Garden.

Miscellaneous.—Cooperation has been continued with the Board of Education of New York City, as more fully recorded elsewhere in this report; with the Botanical Society of America, the Ecological Society of America, and the Editorial Board of Genetics in the publication of the official Journals of those organizations; the American Iris Society in continuing the Test Garden for Beardless Iris; the American Fern Society, of which our Dr. Svenson is treasurer, in connection with the business management of the *American Fern Journal*, edited by our Dr. Benedict; the State Institute for Applied Agriculture on Long Island, as noted by Dr. Reed in his report on page 58; and the forty-seven organizations that have held meetings at the Garden, as listed on pages 139–141.

Inter-Institutional Membership Courtesies.—The exchange of membership courtesies between Brooklyn Botanic Garden and various other botanic gardens and museums is mentioned in detail under the heading "Membership," on page 37.

GIFTS

A list of donors and gifts is given on pages 118–126 of this Report. The gifts, as received, have all been acknowledged with the thanks of the Botanic Garden Governing Committee. It is one of the gratifying features of the preparation of this Report to make public acknowledgment of the gifts and to give renewed expression of appreciation to the donors. In difficult times like these, contributions to educational and scientific institutions are evidence, not only of public spirit and generosity, but also of a realizing sense of the fact that the advancement and diffusion of knowledge are not the least of human necessities. Men do have intellectual and spiritual as well as physical needs.

TWENTY-FIFTH ANNIVERSARY

During December the Governing Committee and the Staff took cognizance of the fact that during 1935 the Brooklyn Botanic Garden will complete the first quarter century of its actual existence, since it was in 1910 that the land was turned over to the Trustees of the Brooklyn Institute of Arts and Sciences to administer as a Botanic Garden, and on July 1, 1910, the first appointment to the Garden personnel took effect. Plans were initiated in December for the celebration of this anniversary by appropriate functions during the usual week of the Annual Spring Inspection, May 13–16.

FINANCIAL

Such financial reverses as the Brooklyn Botanic Garden has suffered during 1934 are difficult to meet. They mean economies which lessen efficiency; they mean retrenchment when the whole situation calls for healthy growth and expansion; they mean economies which spell extravagance; they mean savings which involve losses and impoverishment. But, realizing all this, we keep in mind the encouraging fact that botanic gardens tend to persist, that prosperity, like light, normally comes in waves, so

that crests always follow troughs or depressions—at least they always have.

But if this economic depression, from which the crippled world is now trying to emerge, has emphasized one thing more than another for the administrators of scientific and educational institutions it is the necessity for generous endowment funds conservatively invested. It may seem logical that each generation should finance its own institutions, as a well known philanthropist recently urged, but when the economic structure of the civilized world is endangered, institutions that depend largely on the annual contributions of generous donors are not the least nor the last to suffer. And so we must keep the need of an adequate endowment fund in mind as our most urgent as well as most fundamental need.

Increase in Public Gifts

According to an analysis published in 1934 philanthropic gifts "presumably made from current income" increased about 44 per cent. for the first six months of the year over the corresponding period in 1933 in six large American cities. The amounts for the two years were \$19,868,975 in 1934 vs. \$13,747,320 in 1933. The totals for three major purposes were as follows:

	1933	1934
Organized Relief.....	\$9,986,722	\$8,248,956
Education.....	1,004,252	5,588,944
Fine Arts.....	354,988	1,792,730

From these figures it is seen that the contributions for Relief fell off \$1,737,766, while those for Education and Fine Arts increased by \$4,584,692 and \$1,437,742, respectively. It is interesting (and disappointing) to note that, in such an analysis, including health, play, reform, and religion, besides the three mentioned above, science education (*e.g.* museums) and scientific research are not even mentioned, although we are often said to be living in a preeminently scientific age. However, substantial gifts are being made to both scientific research and education, and the general increase in philanthropic giving for other objects than relief is some indication that we have made a start toward recovery from the depression.

Public Interest in and Support of Science and Art
Cost of Science Education

In our preceding annual report we called attention to a 1932 report of the U. S. Office of Education that the combined public and private support of science education through science museums, in 1930 in the United States, was less than two thirds that of art education through art museums.

An analysis of data taken from the *Handbook of American Museums* for 1932 indicates that fourteen science museums, widely distributed throughout the United States, had in 1930 a total attendance of 8,050,833. The budgets of these institutions total \$3,668,292.00. Dividing the budget figures by the attendance figures, it appears that the total cost per visitor, for 1930, for science museums is 45½¢.

Cost of Art Education

In a similar way, it appears that the total cost per visitor for twenty-one art museums, for 1930, was \$1.58 per visitor. In these institutions, there were included no children's museums, no history museums, no mixed (science-and-art) museums. There were included, for both science and art, the largest museums of the country. The choice was otherwise made primarily with reference to securing a wide geographical range.

The endeavor was also made to choose museums of comparable budgets, but in the art museums one institution was included with a budget of only \$2500. This would tend, of course, to bring down the average for art museums. The lowest budget for any of the science museums was \$14,077.

The attendance figures suggest that there is a much wider public interest in science museums throughout the United States than in art museums.

The budget figures suggest that there is a greater interest in art museums among persons of large wealth, since by far the larger proportion of the financial support of both types of museum is derived from private funds, including annual contributions and endowment derived by bequests and gift, rather than from appropriations by any branch of the government.

To quote from our preceding report, "the large fortunes out of which art has been so generously endowed were made possible, in large part, by scientific research and invention. Few fortunes have been made by art. Art is endowed by science. Science is endowed by art, but not financially." The support of art should not be diminished; but the contributions of science to modern life justify a much more generous financial support both by government and by private philanthropy.

Collections Fund

The annual Collections Fund was instituted initially to provide means for the purchase of plants and publications for the library, and for the enrichment of the herbaria and other collections (whence the name of the fund). For all of these purposes the Garden is wholly dependent on private funds. During 1934 it was necessary (with the consent of donors) to use \$3300, out of \$5807.50 contributed, for the personal service payrolls, leaving only \$2507.50 for the enrichment of the collections. In the face of increasing needs the annual contributions to this fund have steadily diminished during the past eight years, as follows:

1927	1928	1929	1930	1931	1932	1933	1934
\$9,882	\$7,420	\$7,282	\$6,539	\$6,762	\$6,157	\$6,134	\$5,807

There has been a falling off of 41% in the eight year period.

Tax Budget and Private Funds

The Tax Budget appropriation for maintenance for 1934 was as follows:

	<i>Requested</i>	<i>Granted</i>	<i>Change from 1933</i>
Personal Service.....	\$69,266.00	\$67,820.22	\$1,445.78 <i>Decrease</i>
Other Codes.....	16,869.03	14,879.03*	\$1,165.59 <i>Increase</i>
	<u>\$86,135.03</u>	<u>\$82,699.25</u>	<u>\$ 280.19 <i>Net Dec.</i></u>

* Including supplementary appropriation of \$3,133.03 for deficit on Fuel Supplies for the second half of 1933 and for 1934.

The total budget for 1934 was \$7672.72 less than for 1933.

The Private Funds Budget was \$85,550.99, as against \$92,943.52 in 1933, a decrease of \$7392.53.

The Private Funds Budget was \$2851.74 more than the Tax Budget.

For the past seven years the percentages of the two budgets have been as follows:

	1928	1929	1930	1931	1932	1933	1934
Tax Budget.....	48%	43%	44%	48%	50%	47.2%	49.2%
Private Funds.....	52%	57%	56%	52%	50%	52.8%	50.8%

Endowment Increment

By the Endowment Increment plan \$5075.05 was added to the Principal of this account during 1934. This was derived solely as interest on the principal. During 1934 no transfers were made to this principal from other accounts. By the Endowment Increment plan the permanent funds of the Garden have been increased by \$130,064.31 since the plan was adopted 14 years ago (February 1, 1921).

Comparisons with the peak budgets during the six year period ending December 31, 1934, are as follows:

<i>Tax Budgets</i>		<i>Private Funds Budget</i>	<i>Total Budget</i>		
1931.	\$101,400.00	1929.	\$129,322.81	1930.	\$228,867.27
1934.	<u>82,699.25</u>	1934.	<u>85,550.99</u>	1934.	<u>168,250.24</u>
	\$ 18,700.75		\$ 43,771.82		\$ 60,617.03

No comment is necessary to emphasize what a serious matter it is to have a loss of more than \$60,000 in income in four years from a budget of only \$228,000.

APPENDED REPORTS

The Reports on Research for 1934, the departmental administrative reports, and Appendices 1-8 follow as integral parts of the Annual Report.

Respectfully submitted,

C. STUART GAGER,
Director.

REPORTS ON RESEARCH FOR 1934

PLANT PATHOLOGY

BY GEORGE M. REED

Studies on the Inheritance of Resistance of Oat Hybrids to Loose and Covered Smuts

Experiments with the Second Generation of Oat Hybrids.—The second generation plants of four new hybrids were available for the study of inheritance of resistance to loose and covered smuts. One series of second generation plants of each hybrid was inoculated with the loose smut and another with the covered, and the percentage of infected plants determined.

Canadian and Black Norway, the parental varieties of Hybrid 83, are very susceptible to loose smut. Only 18 second generation plants were inoculated with it, 15 of which (83.3 per cent.) were infected. Apparently, the second generation plants are about as susceptible as the parental varieties. The variety Canadian is very susceptible to the covered smut, while Black Norway is resistant. There were 64 second generation plants inoculated with this smut and 8 (12.5 per cent.) were infected. Thus, the results indicate that resistance is dominant in inheritance.

Hybrid 84 is a cross between Scottish Chief, a variety moderately susceptible to the loose smut and resistant to the covered, and Black Mesdag, a variety resistant to both smuts. There were 388 second generation plants of this hybrid inoculated with the loose smut and 70 (18 per cent.) were infected. In this hybrid also, resistance to the loose smut is dominant in inheritance. There were 182 second generation plants of this hybrid inoculated with the covered smut and 9 (4.9 per cent.) were infected. It is interesting to note that although both parents are very resistant to the covered smut, yet a few infected second generation plants appeared.

Hybrid 85 is a cross between Black Mesdag, resistant to both smuts, and Danish Island, a variety very susceptible to the loose smut and moderately susceptible to the covered smut. There were 118 second generation plants inoculated with the loose smut and 34 (28.8 per cent.) were infected. Again, resistance to the

loose smut is dominant in inheritance. In the covered smut series, 131 plants were inoculated and 10 (7.6 per cent.) were infected. In this hybrid also a few infected second generation plants were observed; in view of the moderate susceptibility of Danish Island to the covered smut, this result might be expected.

Hybrid 86, Monarch Selection \times Gothland, is a cross between two varieties very susceptible to the loose smut and highly resistant to the covered. There were 163 second generation plants inoculated with the loose smut and 152 (93.2 per cent.) were infected. Thus, the second generation plants were as susceptible as the parental varieties. There were 166 second generation plants inoculated with the covered smut, and none was infected. The complete resistance of the parental varieties to this smut appears in the second generation.

Experiments with the Third Generation of Oat Hybrids.—In the last Annual Report, the data for the second generation of Hybrid 79, Canadian \times Monarch, Hybrid 80, Canadian \times Monarch Selection, Hybrid 81, Gothland \times Black Mesdag, and Hybrid 82, Danish Island \times Monarch, are recorded. During the past year, many third generation progenies of each of these hybrids were grown. Usually, one series of plants of each progeny was inoculated with the loose smut, and a parallel series with the covered smut.

The parental varieties of Hybrid 79, Canadian and Monarch, are both very susceptible to the covered smut, and in the second generation the percentage of infection was 98.8. There were 52 third generation progenies inoculated with the covered smut, and all of these showed a very high percentage of infection. There was a total of 796 plants, of which 752 were smutted. Thus, the susceptibility of the two parents appears in both the second and third generations.

Canadian is very susceptible to the loose smut, while Monarch is resistant. In the second generation, 39.3 per cent of the plants inoculated with the loose smut were infected. There were 336 third generation progenies grown, of which 228 descended from uninoculated second generation plants. These progenies were classified as 29 resistant, 87 susceptible, and 112 segregating, the latter progenies giving a comparatively low percentage of infection.

Hybrid 80, Canadian \times Monarch Selection, is an interesting contrast to Hybrid 79, since both parents are susceptible to loose smut, while Monarch Selection is resistant to the covered. Practically all of the second generation plants inoculated with the loose smut were infected, and the 25 third generation progenies grown gave high percentages of infection; altogether, there were 402 plants and 399 were infected.

There were 97 second generation plants inoculated with the covered smut and 28 (28.8 per cent) were infected. There were 142 third generation progenies grown, of which 84 descended from uninoculated second generation plants. These progenies were classified as 18 resistant, 40 segregating, and 26 susceptible. These data are in harmony with those obtained for the second generation.

Hybrid 81 is a cross between Gothland, a variety susceptible to loose smut and resistant to the covered, and Black Mesdag, a variety resistant to both smuts. In the second generation, 97 plants were inoculated with the loose smut and 26 (26.8 per cent.) were infected. There were 144 third generation progenies inoculated with the loose smut, of which 84 descended from uninoculated second generation plants. The third generation progenies were classified as 23 resistant, 38 segregating, and 23 susceptible. Again, the results are in close harmony with the data obtained for the second generation.

The second generation of this hybrid gave negative results with the covered smut. It is interesting to note that a few infected plants appeared in some of the third generation progenies. None of the progenies, however, gave a very high percentage of infection.

Hybrid 82 is a cross between Danish Island, fully susceptible to loose smut and moderately so to the covered, and Monarch, a variety resistant to the loose smut and susceptible to the covered. In the second generation, 19.4 per cent. of the plants inoculated with loose smut were infected. In the third generation, 195 progenies were grown, of which 135 descended from uninoculated second generation plants. These progenies were classified as 36 resistant, 15 susceptible, and 84 segregating.

The results with the covered smut on this hybrid are especially

interesting. In the second generation, 71.4 per cent. of the plants were infected, a total of 287 being inoculated. The behavior of this hybrid is very different from that of the other hybrids just mentioned. The results obtained may, however, be associated with the fact that Danish Island occasionally gives some infected plants with the covered smut, Monarch being fully susceptible.

There were 193 third generation progenies of this hybrid inoculated with the covered smut, of which 133 descended from uninoculated second generation plants. Only 1 of these progenies was classified as resistant; there were 52 segregating and 80 susceptible. Most of the susceptible progenies gave 100 per cent. infection.

Experiments with the Fourth and Fifth Generations of Oat Hybrids.—Additional data on the fourth and fifth generations of Hybrids 29 to 32, Fulghum \times Black Mesdag, were obtained, the plants being inoculated with the Fulghum Race of loose smut. Fulghum is quite susceptible to this race, while Black Mesdag is resistant. The families selected had shown a high degree of resistance in the earlier generations, and it was demonstrated that this resistance persisted through the fourth and fifth generations. The lines selected for growing showed various combinations of the morphological characters of Fulghum and Black Mesdag.

The experiments with these hybrids have extended over a period of several years, and extensive data on the second, third, fourth, and fifth generations have been accumulated. The results have been assembled for early publication.

A few third, fourth, and fifth generation families were grown of Hybrid 50, Canadian \times Markton, Hybrids 51 and 52, Early Champion \times Markton, Hybrid 53, Victor \times Markton, Hybrid 56, Gothland \times Markton, Hybrid 60, Monarch \times Markton, Hybrid 61, Seizure \times Victor, Hybrid 62, Scottish Chief \times Victor, Hybrid 63, Gothland \times Monarch, Hybrid 64, Rossman \times Monarch, Hybrid 65, Danish \times Monarch, Hybrid 66, Danish Island \times Monarch, Hybrid 67, Seizure \times Monarch, and Hybrid 68, Monarch \times Scottish Chief, and some points in the inheritance of smut resistance were clarified. The various crosses involve interesting types of combinations of resistance to the Missouri

rices of loose and covered smuts. Studies with these hybrids have also been continued over a period of several years, and are now being prepared for early publication.

The very extensive results obtained with the hybrids between Black Mesdag and Hull-less, Silvermine, and Early Champion, were published during the past year. The accumulated data extended over the second, third, fourth, and fifth generations. One of the most interesting features of the results with these hybrids was the similarity in their behavior to both loose and covered smuts.

The results with another series of hybrids were published in co-operation with T. R. Stanton, Senior Agronomist, Division of Cereal Crops and Diseases, Bureau of Plant Industry, and F. A. Coffman, Associate Agronomist, Division of Cereal Crops and Diseases, Bureau of Plant Industry, Washington, D. C. These hybrids involved various combinations in the resistance of the parental varieties.

Physiologic Races of Oat Smuts

During the past year, particular attention was paid to collections of smuts on varieties belonging to the red group of oats. Five different collections of covered smut on Fulghum, nine collections of loose smut on Fulghum, and four collections of loose smut on Red Rustproof, were grown on an extensive series of oat varieties in order to determine the degree of specialization of these smuts. It is definitely established that the Fulghum race of loose smut is very distinct from the Red Rustproof race, and that both races can be readily separated from many other highly specialized races of loose smut.

The covered smut on Fulghum is particularly interesting because of its ability to attack Black Mesdag, a variety of oats which is very resistant to collections of both loose and covered smuts.

The data obtained have been combined with other data secured in past years and, in cooperation with T. R. Stanton, Senior Agronomist, Division of Cereal Crops and Diseases, Bureau of Plant Industry, Washington, D. C., the results are now being prepared for publication.

The importance of physiologic specialization in the oat smuts is brought out by some of our studies on the inheritance of smut resistance. In most of our studies, the Missouri races of loose and covered smuts have been used, the specific reaction of the parental varieties to these having been determined. In a series of hybrids between Fulghum and Black Mesdag, however, an entirely different race of smut has been used. The reaction of one specialized race on a group of hybrids may be totally different from the reaction of another specialized race.

Cultural Characteristics of the Oat Smuts

Mr. L. Gordon Utter has continued his studies on the characteristics of both loose and covered smuts of oats when grown on artificial media in flasks. Cultures of several of the specialized races of each of the smut species have been grown, and observations made both on the variations and similarities shown by successive transfers. These observations have covered sets of flasks within a single race, as well as sets between several races and even the smut species.

The cultures have been derived from the resting spores (chlamydospores) which constitute the black, dust-like mass replacing the oat floral parts, and also from the conidia which are produced by the germination of the chlamydospores. Observations on four races of the loose smut and six races of the covered smut have been made on cultures from chlamydospores, cultures from single conidia, and cultures from combinations of single conidia. The cultures have been continued by successive transfers over a period of a few months to four years.

The results with the chlamydospore cultures indicate that certain sets of cultures of individual races may show uniformity, while others show considerable variation. The range of variation within an individual race may be as great, or greater, than that between different races. Some of the cultures of particular races have shown very similar characteristics.

One race each from the loose and covered smut, represented by numerous conidial cultures, both singly and in combination, showed many sets to be of similar characteristics. However, there were cases of decided dissimilarity within sets of single

conidial cultures as well as between the various sets. Combinations of single conidial cultures from the two smut species indicated an analogous situation.

Data have been accumulated on 235 chlamydospore and conidial cultures from 11 races of loose smut, and 244 similar cultures of 6 races of the covered smut, which have been grown over a period of from two months to four years. Careful notes have been taken on the color and topographical characteristics of these various cultures. Several races of the loose smut showed that successive transferring from the original culture, carried through one to five culture generations, generally resulted in continuous variations. Certain exceptions, however, were noted. Although these variations were definite, it was observed that the color and topographic characteristics of all the culture sets were confined within a given range.

Culture lines developed from individual spores of a single race tended to exhibit variations both in color and topographic characteristics. When comparisons were made between other individual lines of the same race, or between those of various races, it was found that considerable overlapping of the salient characteristics occurred.

Similar examinations of the cultures of covered smut were made, with results paralleling those previously noted. In general, somewhat less variation was observed in the cultures of covered smut as compared with those of the loose smut.

Sorghum Smuts

Miss D. Elizabeth Marcy has continued her studies on the inheritance of resistance of various sorghum hybrids to the covered smut of sorghum. In previous years, infection of susceptible varieties has been somewhat uncertain, and during the past year some experiments were carried out in order to find, if possible, more effective enviroanal conditions for infection. As a result of modifying the moisture relations of the sand in which the seed was planted, a much higher percentage of infection of susceptible varieties was secured. Six varieties which have been classified as susceptible gave between 79.2 and 100 per cent. infection, much higher than had been obtained in other years.

It was further found that Feterita plants showed a definite effect of inoculation. Uninoculated plants produced normal heads but, if the plants were inoculated, approximately 50 per cent. of them failed to produce normal heads, the flower buds being blasted, and very little, if any, grain produced. Sometimes smut balls were found on the blasted heads, showing that the smut mycelium had developed in the plant, reaching the stage of spore formation. Occasionally, a typically smutted head was observed, as in other years. A few blasted heads of Feterita had been observed in previous years, and this peculiar effect upon this variety is especially important in interpreting the results with the hybrids. The inoculated Milo plants, as in previous seasons, showed no evidence of infection. While Feterita, under usual conditions, may be classified as a resistant variety, it is evidently genetically quite different in its response to that of the Milos.

During the past year, a considerable number of first generation plants were inoculated with the covered smut. The first generation plants of crosses between Feterita and susceptible varieties were infected. The first generation plants of crosses between two susceptible varieties, such as Dawn Kafir and Red Amber Sorgo, also were infected. The first generation plants of crosses between Milo and susceptible varieties remained normal.

A large number of second generation plants of crosses of three different types, based on the behavior of the parental varieties, were grown. In the cross between Feterita and Dwarf Yellow Milo, occasional smutted and blasted plants were observed in contrast to previous years, when none was recorded.

In the second generation of hybrids between susceptible varieties and Feterita, a large percentage of the second generation plants were either blasted or infected, 50 to 77.5 per cent. having typical smutted heads. The results clearly indicate that susceptibility is dominant. On the other hand, when these varieties are crossed with the Milos, no blasted heads appear in the second generation, and there is a low percentage of infection, ranging from 13.7 to 25 per cent. It is evident that the Milo factor of resistance is very different from that of Feterita. A hybrid between two susceptible varieties, Dawn Kafir and Red Amber Sorgo, gave 100 per cent. infection in the second generation.

A series of 264 third generation progenies belonging to nine different hybrids was inoculated with the covered smut. These involved various combinations of smut resistance in the original parental varieties. In the hybrids in which Feterita was one of the parents, many blasted plants appeared. These were in striking contrast to the hybrids in which the Milos were the resistant parents.

There were 441 fourth generation families of several hybrids grown. These were tested to determine the relation of resistance and susceptibility in the third generation by observing the behavior of the fourth generation. Altogether, 75 fifth generation families of the hybrid between Feterita and Sumac Sorgo were grown, and additional light on the inheritance of susceptibility in this hybrid was obtained.

The loose smut of sorghum was also used in a large number of experiments. First generation plants, as well as second, and 273 fourth generation progenies were inoculated, and extensive data on their reaction to the loose smut have been obtained.

It was possible to carry out these extensive experiments with the sorghum smuts through the courtesy of Director H. B. Knapp and his associates, State Institute of Applied Agriculture on Long Island, Farmingdale, L. I. Approximately one acre of land was placed at our disposal, making it possible to grow about 26,000 plants. The large amount of data accumulated on all these sorghum hybrids is being prepared for early publication.

GRADUATE STUDENTS AND INDEPENDENT INVESTIGATORS ENROLLED DURING 1934

During the past year, Mrs. Marie E. Conklin continued her investigations on the bacteria which form tubercles on the wild legumes. Her studies involve the problem of the cultural characteristics of the bacteria isolated from different plants, and also their capacity for infecting. She has accumulated a large amount of data, and is now preparing her results for publication.

Dr. Elva Lawton, a member of the Biology Department of Hunter College, has continued her studies on regeneration and polyploidy in ferns.

Dr. Frances A. Hallock continued her studies of the morphology and relationship of the evergreen shrub *Garrya*.

FOREST PATHOLOGY

BY ARTHUR HARMOUNT GRAVES

Chestnut Breeding Work in 1934

For the benefit of those who are not acquainted with this work, it should be stated that the project consists of the interbreeding of various species and types of chestnut, with the object of replacing, if possible, with new stock, our valuable native chestnut trees. As is generally known, these have now practically disappeared from the forests of North America as the result of a deadly disease caused by the fungus, *Endothia parasitica*. The progress of the work in previous years has been recounted in former volumes of the *Brooklyn Botanic Garden Record* (19: 62-67; 20: 83-87, 21: 46-53; 22: 57-63; 23: 67-75). It was stated in last year's report that "For the present our method is to cross-pollinate the blight-resistant Japanese chestnut, a [comparatively] low-growing, orchard type of tree, with the susceptible American timber tree, in the hope of getting, among the offspring of these two parents, the desired combination [of characters], that is, a blight-resistant tree of the tall timber type."

This plan has been considerably extended during the past year: we are now making crosses between as many species and hybrids as we can; and we are finding, incidentally, that the different forms are readily amenable to hybridization. It is scarcely necessary to add that in this way we shall obviously increase the chances of ultimate success. Since the Garden plantations are too limited in area to include any considerable planting of chestnut trees, the trial grounds for this work, covering several acres, are located on land belonging to the writer, a 40-acre plot on the southern slopes of Mt. Carmel (known locally as the "Sleeping Giant") in the township of Hamden, near New Haven, Connecticut.

Blooming of Hybrids. By far the most important development of the past year was the blooming of three of our Japanese-American hybrids, which were only in their *third* year of growth. American chestnut seedlings (*Castanea dentata*) bloom ordinarily between the ages of 10 and 15 years, Japanese (*C. crenata*) sometimes as early as 5 years of age. "Blooming," or the ap-

pearance of flowers, means that sexual organs have been formed and germ cells (presumably) have been developed for reproductive purposes. In other words, it means the potential beginning of a new generation of individuals. For, if the egg in the pistil is fertilized by a sperm from the pollen grain, an embryo plant begins to grow, which when fully developed, forms the essential part of the seed. Here, the seed is also surrounded by the ovary wall—the whole forming the “chestnut.” *

This early blooming is a phenomenon that is to be expected in hybrids, and is an expression of what geneticists call “hybrid vigor” or *heterosis*. Hybrid vigor has been known and studied from the time of Koelreuter (1765), who makes the following interesting and (for the times) rather surprising remark: “I would wish that I or another were so fortunate as to obtain a hybrid of trees, which, in respect to the utilization of their wood, might have a great economic influence. Perhaps such trees among other good characteristics might also have these, that, if the natural ones required for their full growth, for example, a hundred years, they would reach it in half this time. At least I do not see why they should behave differently in this respect from other hybrid plants.” †

What a vast difference such precocious flowering makes in our problem will be clear when one reflects that it means three years between generations instead of ten or more. We do not expect the future generations to continue as short as this; but, on the other hand, we are no longer counting on ten years as the minimum time for a single generation. A second cross of one of these hybrids, made this year, has yielded two nuts, one of the parents being again the American chestnut, from pollen received from the U. S. government nursery near Washington, D. C. Since these hybrids are still small (about 2 feet high at the beginning of

* The two large parts (almost halves) of the chestnut, just as in the bean or the peanut, are the first leaves of the embryo; the rudimentary stem and root are tiny organs located at the base of these fleshy leaves, where all the parts come in contact.

† Quoted from Roberts, H. F. *Plant hybridization before Mendel*. Princeton, 1929, p. 55. See also Koelreuter, J. G. *Vorläufige Nachricht von einigen das Geschlecht der Pflanzen betreffenden Versuchen und Beobachtungen*. Dritte Fortsetzung. 1765.

the season) it is hoped that height growth may be increased by this second dose of the American parent.

New Hybrids in 1934.—Another important development of our work in 1934 has been the production of new hybrids. Incidentally, it should be stated that all of the hybridization work this year was carried on at the trial grounds at Hamden, because many of the trees there have now reached the age of bearing flowers and nuts. The pollen used for crossing was in all cases carefully bagged before the anthers dehisced, for there is of course danger of contamination from various causes—chiefly insects and wind. The American pollen (of *Castanea dentata*), which was supplied as usual through the cordial cooperation of the Division of Forest Pathology, U. S. D. A., had also been bagged at an early stage. The hybrids produced in 1934 (at least as far as the embryo stage in the nuts) are as follows:

- (1) 2 Smith hybrids (Jap. \times Amer. *i.e.* *crenata* \times *dentata*, 3 yrs.*) crossed with American chestnut (U. S. D. A.)
- (2) 12 Chinese chestnut (*C. mollissima*, 8 yrs.) crossed with *Castanea dentata* (U. S. D. A.)
- (3) 19 Chinese chestnut (*C. mollissima*, var. Mammoth, 6 yrs.) crossed with American Chestnut (U. S. D. A.)
- (4) 7 Chinese chestnut (*C. mollissima*, 8 yrs.) crossed with *Castanea Seguinii* (8 yrs.)
- (5) 4 Chinese-chinquapin hybrids (*mollissima* \times *pumila*) 6 yrs., crossed with American chestnut (U. S. D. A.)
- (6) 4 Japanese forest type (*C. crenata* var., 6 yrs.) crossed with American chestnut (U. S. D. A.)
- (7) 8 "S8" (8 yrs.) crossed with Japanese forest type chestnut. (*C. crenata* var., 6 yrs.)
- (8) 1 "S8" (8 yrs.) crossed with American chestnut. (*C. dentata*) (U. S. D. A.)

(Total) 57

As far as can be ascertained from definite, published records, these combinations are all new to science.

With the exception of the first case, which has already been explained, a few remarks about some of these crosses may be of

* The ages of the parents as of 1934 are given, where possible, in parentheses.

interest. The numbers in parentheses refer to the different crossings, as numbered above.

(2) The Chinese chestnut, as far as blight resistance is concerned, is our finest stock. For the whole six years we have had these trees they have never shown a sign of blight. Of the row of fifteen trees the average height is now about 8 feet. Several are 9 feet high, and two are eleven. In spite of repeated pruning of the lower branches, they persist in developing into a low-headed form, *i.e.* the side branches grow out with greater vigor than the main shoot. Therefore, in view of our aims, a crossing with the more upright-growing American chestnut seems desirable.

(4) In our form of the Chinese chestnut only one, if any, bur appears at the base of a flowering branch. The dwarf species, *C. Seguinii*, from Eastern and Central China, on the other hand, is most prolific; and, in addition, blooms from June to October. It will be seen that crosses of these two species may produce valuable breeding stock.

(7) "S8," a cross made by Dr. Van Fleet, is said to be a hybrid of the chinquapin, *C. pumila*, and the Chinese chestnut, *C. mollissima*. It is extremely prolific, but, unfortunately, somewhat susceptible to the blight. Therefore we gave it a dose of the resistant Japanese this year, and hope for more disease-resistant offspring. "S8," pollinated with *mollissima*, gave negative results.

Data on Hybrids now Growing at Hamden.—In all, there are now growing at Hamden 97 Japanese-American hybrid chestnuts. This figure does not include, of course, the 57 hybrid nuts formed as a result of crosses this year. The heights and numbers of the hybrids at Hamden are as follows:

TABLE OF GROWTH RATES OF JAPANESE-AMERICAN HYBRID CHESTNUTS AT
HAMDEN, CONNECTICUT, 1934

Name	Number of Trees	Average Height	Average Length
	Living October	October	Growth, 1934
Folk 1931.....	1	4 ft.	10 in.
Hammond 1931.....	4	4 ft. 10 in.	1 ft. 2 in.
Hammond 1933.....	7	1 ft. 3 in.	1 ft. 3 in.
Minturn 1933.....	8	1 ft. 5 in.	1 ft. 5 in.
Smith 1931.....	47	3 ft. 5 in.	1 ft. 1 in.
Smith 1932.....	27	1 ft. 4 in.	8 in.
Winthrop 1931.....	3	2 ft. 9 in.	11 in.

The prize tree, a Hammond Japanese-American hybrid of 1931, is now 7 feet high, at the end of its third year. The growth rate has obviously decreased from those of the previous two years. It was also cut back a little in the spring, on account of possible winter injury to the tips of the branches. We have now three Smith hybrids (3 yrs. old) which are over 5 feet in height. Here again we have an illustration of what is meant by "hybrid vigor."

Winter Injury.—The effect of the extreme cold of the winter of 1933–34 on the various species and hybrids of chestnut was most interesting. The mercury fell as low as 24° below zero, the neighbors reported. In the two plantations, one in fine garden soil lower down the mountain and the other in poorer soil farther up, the differences in the extent of the damage were very marked. The upper plantation fared much the worse, some of the Folk (pure) Japanese being badly killed, even to the ground. One especially, which had grown to a height of 8 feet, was killed to the ground. Here also, many of the Europeans from Paris, Geneva, and Berlin (one year old), as well as the "Italian" seedlings set out in the spring of 1932, were killed to the ground, and some were killed outright. The European seedlings in the nursery at the Brooklyn Botanic Garden were also badly injured. Many of the Europeans, however, sprouted up from the base this year. The following is a general summary of the character and amount of winter injury in the different types.

1. *Castanea dentata*, American chestnut; not injured in the slightest degree.

2. *C. crenata*, Japanese chestnut; usually killed back along the tips of the branches and in some cases badly killed back to the main trunk. In a few cases five year old trees were killed to the ground. Also, the buds were injured, as shown by peculiar one-sided, cup-shaped, deformed leaf development from these buds later in the year. Sometimes the wood was blackened, as seen by cutting through the twig.

3. *C. sativa*, European or "Spanish" chestnut; badly affected: some killed to the ground, some entirely dead.

4. *C. mollissima*, Chinese chestnut; came through the winter entirely uninjured.

5. *C. Henryi* was badly winter killed.

6. *C. Seguinii* was also winter killed (as usual.)

7. The Japanese-American hybrids came through very well on the whole. The tips of the twigs were killed back in some cases, especially where there had been a third season's growth in 1933 and the wood was not mature. Most of this third season's growth was pruned off in the spring of 1934.

It is very interesting to see how the hardiness can in most cases be referred back to the native environment of these species. Thus the Chinese *C. mollissima* and the American *C. dentata* were perfectly hardy, while the European ("Spanish") *C. sativa* and the Japanese *C. crenata* were susceptible, the former extremely so.

Blight and Other Diseases.—Two of our Smith hybrids of 1931 had side branches affected with blight; one of the Japanese forest type (78634) was badly blighted following winter injury; one of the Americans from seed received from Mr. Thomson in 1931 was slightly blighted; and one American from Portland, Maine, nine years old, was blighted entirely to the ground. Two of the Japanese forest type showed fungi in old pruning scars; in one case, *Polystictus versicolor*; in the other, *P. pergamenus*. In both cases the fungus appeared pathogenic, but the trouble may have been linked up with a weakening of the stem tissues through winter injury.

Insects.—The aphid (*Calaphis castaneae*) which was found on the leaves late in the summer of 1933, put in an early appearance this year (about July 10), curling the leaves and in a few cases causing them to become chlorotic. The trees were sprayed thoroughly with soap and nicotine sulphate five times in the summer, viz. July 15, 16, 28, August 19, September 1, with the result that the pest was kept under control.

New Plantings and Distributions.—Besides the 17 hybrid seedlings of 1933, 29 2-yr. old Spanish (*C. sativa*) chestnuts were planted in sod land (15 feet apart) at Hamden. These Europeans are from seed I arranged to have sent here when I visited European botanic gardens in 1932. There are still 21 Europeans from Berlin in the nursery at the Garden. In addition, 13 Americans, from seed given us by Miss Hilda Loines, Dr. H. K. Svenson, and Dr. M. F. Schlesinger, were planted in the same lot. About 80 "natural" nuts, *i.e.* those which had developed without artificial pollination in our own plantations, were planted in newly cleared forest land in "spots" 6 feet apart. Trees of *C. sativa* from the Garden nursery were given to the following:

Mr. John Herlihy for planting at Prospect Park, Brooklyn	11 trees
Miss Maud H. Purdy for planting at Pomona, N. Y.	6 "
Mr. Frank Stoll for planting at Layton, N. J.	6 "

Chinquapins.—*Castanea pumila*, the chinquapin, is an important shrubby species with small nuts, native in the southern states and not yet growing in our plantations. This species is reported to be blight-resistant to some extent. We were fortunate, during the fall, again through the cooperation of the Division of Forest Pathology, U. S. D. A., in securing a fine lot of nuts of this species from Mr. D. A. Bisset, of the U. S. D. A. Plant Introduction Station at Savannah, Ga.

Propagation.—Experiments are now under way at the Garden and at Hamden in grafting and layering, by which we hope to propagate the desirable forms asexually.

Total Number of Trees Growing.—We have now growing on our plantations a total of 398 trees of the various species and hybrids. This includes 21 Europeans, 2 yrs. old, still growing in the Garden nursery.

SYSTEMATIC BOTANY

BY ALFRED GUNDERSEN

The Classification of Dicotyledons

The study of flower structures and flower buds, with special reference to placentation, has been continued. Miss Maud Purdy has now drawn altogether more than two hundred species. Some of these are incomplete in one way or another but in the great majority of cases have much more detail than is available in published illustrations. The drawings represent nearly two hundred genera, about a hundred families. The work on any one flower often cannot be completed at one time, because flowers are at a certain stage and an earlier stage is wanted. The time of the year that it should be looked for is then estimated. For example, the early stages of the buds of early spring flowers must usually be taken the preceding summer or early fall.

The Brooklyn Botanic Garden is laid out by the Engler system, which was proposed nearly half a century ago as a modification of the Eichler system which is, in turn, a modification of the Bentham and Hooker system. At first the information on

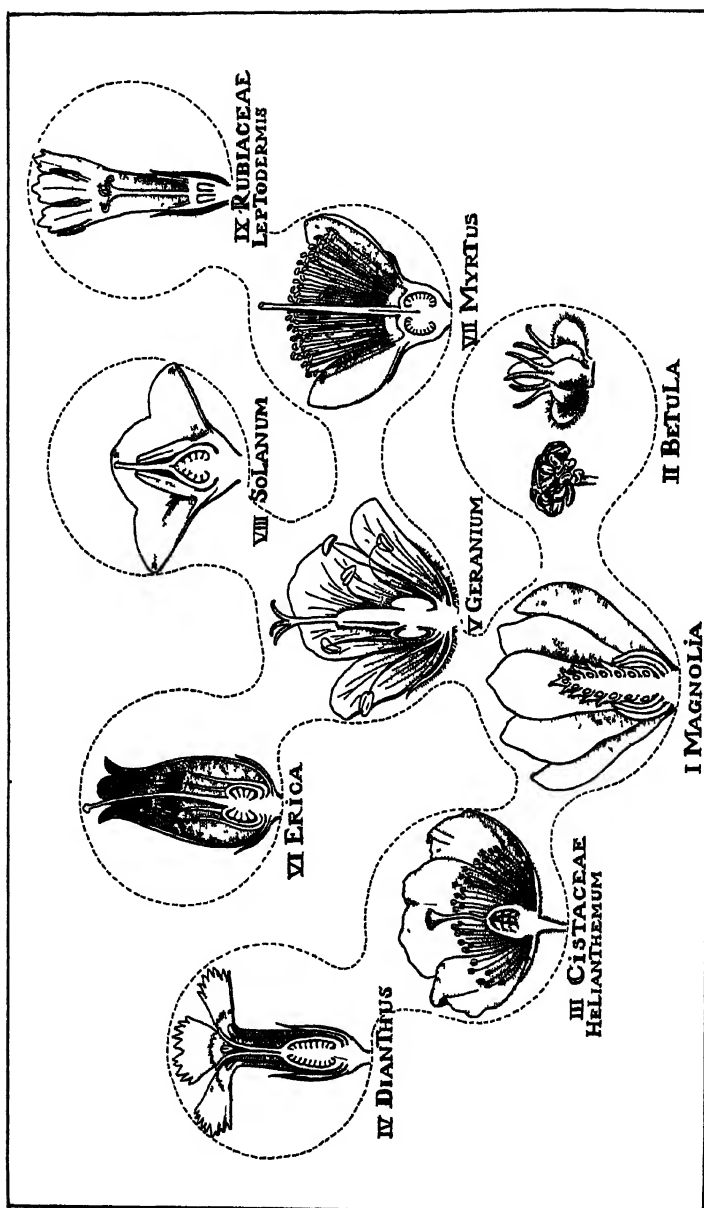


FIG. 10. Classification of Dicotyledons based upon flower structure. The relative size of the ovaries is exaggerated for clearness.

flower structures and the drawings themselves were classified by the system of our Garden. Gradually, however, the desirability of certain changes became more and more convincing.

Of more recent systems, that of Bessey and that of Hutchinson may be considered as somewhat extensive modifications of the Bentham and Hooker system. The Warming and Wettstein systems are less extensive modifications of the Engler system.

Perhaps the truth may be near the middle of conflicting views. It may be possible to modify the Engler system slightly more than is done in the Warming and the Wettstein systems, but without departing from it so far as is done in the Bessey and the Hutchinson systems. This is attempted in the following outline of Dicotyledons, illustrated on p. 66:

A. Carpels separate or single

- I. Magnoliflorae—Magnolia, Rose and perhaps Protea Groups of families.
(Stamens usually numerous, petals separate or absent, flowers often large, mostly trees and shrubs)

B. Carpels united

- a. *Flowers inconspicuous, mostly wind pollinated*
- II. Betulaeflorae—Betula and Ulmus Groups. (Mostly trees and shrubs)
 - b. *Flowers with conspicuous double perianth, insect pollinated*
 - α *Placentation usually parietal*
- III. Cistiflorae—Cistus, Papaver, Cactus and Gourd Groups. (Sepals separate, stamens often numerous, embryo often curved) Cf. Bentham and Hooker
 - β *Placentation central or basal*
- IV. Dianthiflorae—Dianthus, Piper and Primula Groups. (Embryo usually curved, mostly herbaceous plants). The connections Cactaceae-Aizoaceae and Frankeniaceae-Caryophyllaceae make this position necessary.
 - γ *Placentation usually axile*
 1. *Ovary usually superior*
- V. Geraniflorae—Geranium, Maple and Rhamnus Groups. (Carpels often but slightly united, floral parts often in five's, usually two staminate whorls, petals separate)
- VI. Ericaeflorae—Erica Group. (Floral parts as in Geranium Group, but sympetalous)
- VII. Solaniflorae—Solanum Group. (Carpels usually 2, stamens in single whorl, epipetalous, corolla sympetalous)
 2. *Ovary usually inferior*
- VIII. Myrtiflorae—Myrtus, Hydrangea and Cornus Groups. (Polypetalous)
- IX. Rubiflorae—Rubia and Composite Groups. (Sympetalous)

The Genus Staphylea

Mr. Charles F. Doney, Curatorial Assistant, concluded his studies of the genus *Staphylea*, submitted as a Master of Science thesis to New York University, in harmony with the agreement of April 1st, 1916 between the University and the Botanic Garden.

Check List of Trees and Shrubs

With the cooperation of Mr. Alfred Rehder, of the Arnold Arboretum, and Mr. Henry Teuscher, of the New York Botanical Garden, this list is now nearing completion. The list bears somewhat the same relation to Rehder's Manual that Dalla Torre and Harms's *Index* bears to the *Pflanzenfamilien*.

SYSTEMATIC BOTANY

BY HENRY K. SVENSON

Flora of Galapagos and Cocos Islands

During the past year, some time was spent in re-arrangement of the manuscript of the plants of the Astor Expedition to the Galapagos and Cocos Islands (1930). This manuscript, which is a catalogue of the plants, exclusive of the ferns, will be published in the February, 1935, issue of the *American Journal of Botany*. Publication of this account has been made possible by the generosity of Mr. Vincent Astor. The paper consists primarily of notes on the habitat and altitudinal distribution of the species collected, with scientific description and discussions of new or noteworthy plants obtained on this expedition. There are nine plates illustrating the types of vegetation, both by line drawing and photography. Brief accounts of the general aspects of the vegetation on the separate islands which were visited are also included. A reproduction of one of the plates, drawn by Miss Maud H. Purdy, Brooklyn Botanic Garden artist, is included in this report. It illustrates the variation found within a single species, *Croton Scouleri*, a shrub or small tree found only on the Galapagos Islands, and evidently the "commonest hush" seen by Darwin (*Voyage of the Beagle*, ed. 2, p. 399. London, 1913). One of the most interesting problems of the Galapagos Islands is whether variations are confined to individual islands, thus showing the origin of definite varieties by geographic isolation, or



Fig. 11. *Viscaria* in *Catane* *Seas* from these islands of the Galapagos 1

whether they are chiefly the response to sharply varying conditions of moisture on the same or adjacent islands. In the case of *Croton Scouleri*, the leaf shape varies strikingly from the var. *Macraei*, found on the desert coast of Indefatigable Island, to var. *grandifolius* of the moist interior. Transections showing the altitudinal range of species of the moist windward slopes and dry leeward slopes of all the larger islands (similar to the altitudinal tables for plants of the Academy Bay Region) would show a conformity from island to island, and would probably go a long way toward an understanding of their complex flora. Due to the rough nature of the ground and the difficulties in transporting food and water, such studies would undoubtedly require a long time.

On the other hand, the vegetation of Cocos Island appears comparatively simple. Like most oceanic islands which have a wet tropical climate, the vegetation consists for the most part of ferns (often tree-like), orchids, and *Melastomaceae*. The species, as a whole, appear to be closely tied up with those of the adjacent Central American mainland.

Studies of Bidens

The problem of the species and varieties of *Bidens* centering on the Hudson River in New York has interested me for a number of years; I have made large collections of this genus on the tidal shores of both the Hudson and Hackensack rivers. Also I have continued the growing of unusual types in the greenhouse, which is not difficult, since the species are annuals and mature rapidly. *B. hyperborea*, a northern species extending from James Bay to the Merrimac River in eastern Massachusetts, was found last year in the Hudson River.

I have continued work on a flora of the Windham Valley in the northern part of the Catskill Mountains, an area which has been comparatively neglected by local botanists, and have made substantial progress in the collection of material.

From time to time, progress has been made in the complex genus *Eleocharis*. The plates and much of the manuscript for the group *Tenuissimae*, principally of tropical America and tropical Africa, are now ready. During the past year the *Eleocharis pauciflora* group was revised. *E. pauciflora* is represented from

the Himalayas, boreal Eurasia and North America, and from the Andes in South America. As might be expected, various forms are assumed by the species in these diverse geographical areas. The variety from northeastern United States and Canada has been set apart as *E. pauciflora* var. *Fernulzii* (Rhodora 36: 380. 1934). A new species of *Eleocharis* from Brazil was described as *E. squamigera*.

GENETICS

BY RALPH C. BENEDICT

A Study of Variation of Nephrolepis

My study of variation in the fern genus, *Nephrolepis*, began at the Brooklyn Botanic Garden twenty years ago, in January, 1915. Since that time, special attention has been given to two types of variation: (1) bud variation of *Nephrolepis exaltata bostoniensis*; (2) variation in the spore progeny of *N. exaltata fertilis*. Incidentally, considerable attention has been paid to the study of variation among the natural species of this genus.

Beginning early in 1934, this phase of the problem has been taken up more intensively. The help of a considerable number of botanists the world over has been requested in the collection of species of *Nephrolepis* native in their regions. A special phase of this study has been the initiation of spore cultures of a number of different species. By this method, it is hoped that the collection of plants of various species may be increased, and that a comparative study of the gametophytic stage of the different species may be accomplished.

ECONOMIC BOTANY

BY RALPH H. CHENEY

Studies of Coffea arabica

A study of the molds which develop on commercial coffee essences and prepared, concentrated liquids was begun. The investigation concerning the formation and histology of the coffee leaf glands has progressed.

The summer of 1934 was devoted to research at the Marine Biological Laboratory at Woods Hole, Massachusetts. The

effect of caffeine, extracted from the seeds of *Coffea arabica* Linn., upon the auricular and ventricular muscle of the heart was determined. An experimental study of the possibility of a physiological antagonism between the plant alkaloids, caffeine and nicotine, as indicated by their combined effect upon the animal organism, was undertaken.

REPORT OF THE CURATOR OF PUBLIC INSTRUCTION FOR 1934

DR. C. STUART GAGER, DIRECTOR:

Sir: I submit herewith my report for the year ending December 31, 1934.

GARDEN ATTENDANCE

Grounds.—As recorded by the turnstiles at the five entrance gates, total attendance at the Garden during 1934 was 1,352,407, as against 1,315,847 for 1933. This is an increase of 36,560, or nearly three per cent. A comparison of the table of attendance (p. 73) with that of other years brings to light several interesting points. For example, the small attendance for the month of February (46,663), doubtless due to the fact that this was an extremely cold month, was the smallest for this month since 1927 (43,579). But the figures for the months of August, September, October, and November are the largest for each of those months in the history of the Garden. The total for these four months was 452,696, or nearly one-half million people, as against 358,924 for 1933. The combined attendance at classes and lectures was 139,370, as against 126,934 for 1933, and 128,982 for 1932.

Conservatories.—In the total number of visitors to the conservatories during the year, 134,252, the all-time high record of last year (139,544) is nearly equalled. One figure deserves especial notice—the attendance during the month of April—30,262—which means an average of over 1,000 visitors a day. This considerably exceeds the record greenhouse attendance made in April, 1933—29,062. Evidently Chaucer's statement, "Than (*i.e.* in April) longen folk to goon on pilgrimages" is as true today as it was at approximately 1400 A.D., and an objective of many a Brooklyn pilgrimage in April is the Conservatory of the Brooklyn Botanic Garden.

ATTENDANCE AT THE GARDEN DURING 1934

	Jan.	Feb.	Mar.	Apr.	May	June	July
At regular classes	1,234	1,424	1,706	2,666	3,056	2,637	18,000
At visiting classes	144	492	1,590	4,469	20,646	8,752	342
At lectures to children . . .	1,000	331	1,284	2,613	15,916	6,583	165
At lectures to adults . . .	150	100	600	447	685	368	62
At conservatories	6,747	4,929	9,833	30,262	19,356	10,363	8,259
At grounds . .	55,452	46,663	79,107	198,426	221,780	140,078	112,855

	Aug.	Sept.	Oct.	Nov.	Dec.	Annual Totals
At regular classes . . .	15,000	1,109	2,475	2,694	2,199	54,200
At visiting classes . . .	12	105	3,549	5,080	2,154	47,335
At lectures to children	0	270	2,072	3,000	1,599	34,833
At lectures to adults . .	0	50	360	140	40	3,002
At conservatories	9,392	8,573	9,367	10,220	6,951	134,252
At grounds	116,010	123,916	126,176	86,594	45,350	1,352,407

SCHOOL SERVICE

We have continued to supply study material to the high schools, junior high schools, and colleges, for a small charge—a measure which, it may be recalled, we were forced to adopt last year on account of the overwhelming demand for material of this sort. This service has been in charge of Miss Julia E. Best, who came to us last year to take over this part of our work. The following figures indicate to what extent this charge for material has affected the demand.

STATISTICS OF PETRI DISH SERVICE, 1931-1934

	1931	1932	1933	1934
No. of requests for all material for the year	387	398	421	247
No. of petri dishes filled during year	5482	5727	4888	1154
C.c. of agar distributed in flasks during the year	11800	8400	12800	12600

In 1934 there was a noticeable reduction in the number of requests for all study material. As regards the most expensive item, *i.e.*, the Petri dishes, there was a conspicuous falling off at once in the fall of 1933, when the charging system was inaugurated, less than $\frac{1}{3}$ as many being ordered as in the fall of 1932; in the spring of 1934 there was a greater reduction, less than $\frac{1}{4}$ as many being ordered as in the previous spring; and in the fall of 1934 a still further reduction from 1933.

ADULT CLASSES AND COURSES

New Courses.—Two new courses which began in September were given by Miss Rusk. The course entitled "Flowering Plants: Field and Laboratory Study" (B10) has for its principal object an acquaintance with the species of wild flowering plants (including weeds) in this vicinity. The field work is done largely in the grounds of the Botanic Garden. The laboratory work consists of examining flowering plants and identifying them by means of a key. The course in "Genetics" (B17) comprises a discussion of Mendelian principles and the physical basis of heredity, with demonstrations. Both of these courses, which are now offered as a result of repeated requests on the part of the students for more advanced work, are accredited as "Teachers Courses" by the Brooklyn Teachers Association and each carries 2 credits. Miss Rusk gave a laboratory and field course of six sessions to members of high school clubs, in cooperation with the American Institute. A new course entitled "Practical Gardening" was given Saturday afternoons from February 2 to March 9 by Mr. Free.

Other Courses.—202 persons registered for the course in "Flower Arrangement" given in January and February—a nearly 100 per cent. increase over the number in 1933 (108). The lecturers were Mrs. William H. Cary; Mrs. Rioichiro Arai, assisted by Mrs. E. F. Eidlitz and members of the Japanese Women's Club of New York; Mrs. E. F. Austin; Mrs. Walter R. Hine; and Mrs. S. A. Brown. This course is sponsored by the Woman's Auxiliary. The course on "Trees and Shrubs of Greater New York" was conducted by Miss Vilkomerson and myself as usual. Fifteen persons registered in the spring and 36 in the fall. In the course

for nurses-in-training, classes came in both spring and fall from Kings County, St. Johns, and Prospect Heights Hospitals. The registration was 38 in the spring and 65 in the fall. At the last exercise of the course, for both terms, Mr. Jonathan Gordon, Ph.G., as in 1933, gave the lecture on drugs, their identification, preparation, and standardization.

Cooperation with Long Island University.—This year, for the first time, those courses in botany offered by the Brooklyn Botanic Garden which are open for credit to students of Long Island University, were described in the catalog of the University. Five courses were offered. The arrangement made will be understood from the following, which appears on page 67 of the University Catalog for 1934–1935.

“Any student desiring to take these courses for credit toward an undergraduate degree should notify the Dean or Professor Cheney, who will give him a card entitling him to admission to the course or courses he has selected. The students should present this card at the beginning of the first session of the course.”

Total Registration in Adult Courses.—Adult registration was the largest in the history of the Garden. A total of 927 persons registered. The figures for registration for the last few years follow:

<i>Year</i>	<i>Persons Registered</i>
1929	764
1930	802
1931	823
1932 ..	908
1933 ..	823
1934	927

One of the duties of this department is to prepare, each week during the school term, a schedule of educational activities for the ensuing week. One of these schedules, appended, illustrates the number and scope of the activities.

BROOKLYN BOTANIC GARDEN CLASS SCHEDULE
May 14-19, 1934

Date	Class	Subject	Lantern	No.
Monday, May 14 . . .	P. S. 72	Trees	X	80
	P. S. 241	Bklyn. Bot. Gdn.	X	40
	P. S. 26	Bklyn. Bot. Gdn.	X	300
	P. S. 184			
	P. S. 117 Mothers Club	Bklyn. Bot. Gdn.	X	75
Tuesday, May 15.	Woman's Club	Lecture		12
	Junior H. S. 96	Transplanting		40
	P. S. 150	Bklyn. Bot. Gdn.	X	30
	P. S. 241	Bklyn. Bot. Gdn.	X	40
	Newtown H. S.	Bklyn. Bot. Gdn.	X	30
	P. S. 241	Japanese Garden	X	40
	P. S. 2	Wild Flowers	X	45
	Junior League	Meeting and Address		
	Class: Course B2	Nature Study		20
	Class: Course B7	Greenhouse Work		20
Wednesday, May 16	Visiting Club	Japanese Gardens		
	Nurses Course, D1	Medicinal Plants		13
	P. S. 129	Bklyn. Bot. Gdn.	X	80
	P. S. 188			120
	P. S. 241	Gardens	X	40
	P. S. 130	The Japanese Gdn.	X	45
	P. S. 184	Bklyn. Bot. Gdn.	X	120
	P. S. 26	Bklyn. Bot. Gdn.	X	90
	P. S. 73	Conservation	X	75
	Berkeley	Nature Study		25
	Torrey Botanical Club	Meeting and Address		
	Class: Course B3	Agric. and Hort.		30
Thursday, May 17 . . .	Dept. Heads, City Schools	Meeting and Address		
	P. S. 68	Bklyn. Bot. Gdn.	X	120
	P. S. 110	Bklyn. Bot. Gdn.	X	100
	Adelphi	Trees	X	30
	Class: Course A18	Ornamental Shrubs		15
	Far Rockaway	Luncheon		
	P. S. 241	Plants of Desert	X	80
	P. S. 159	Wild Flowers	X	45
	P. S. 200	Bklyn. Bot. Gdn.	X	45
	Woman's Club	Lecture		
Friday, May 18	Class: Course B1	General Botany		
	Class: Course A18	Ornamental Shrubs		25
	Nurses Course, D1	Medicinal Plants		25
	Brooklyn Training	Bklyn. Bot. Gdn.	X	30
	P. S. 226	Bklyn. Bot. Gdn.	X	200
	P. S. 206	Nature Study	X	40
	P. S. 241	The Japanese Gdn.	X	40
	P. S. 130	Bklyn. Bot. Gdn.	X	45
	Class: Course B1	Laboratory		
	Children's Classes	Outdoor Garden		
Saturday, May 19 . . .	Field Class: Course A11	Flowers and Ferns		230
	Field Class: Course B10	Trees and Shrubs		

FLOWER DAYS

Six Flower Days were observed during 1934. The following list gives the dates, leaders, and subjects.

1. Tuesday, April 17. Daffodil Day. Mr. B. Y. Morrison, Head of Division of Plant Exploration and Introduction, U. S. D. A.; Secretary, American Iris Society; Editor, National Horticultural Magazine. "Daffodils."

2. Tuesday, May 22. Rose Garden Day. Mr. Montague Free, Horticulturist, Brooklyn Botanic Garden, and President, American Rock Garden Society. "Styles in Rock Gardens."

3. Tuesday, May 29. Iris Day. Mrs. Colin S. McKinney, Author of "Iris in the Little Garden." "Iris."

4. Tuesday, June 12. Seventh Annual Rose Garden Day. Mr. Montague Free, Horticulturist, Brooklyn Botanic Garden. "Roses and the Winter."

5. Tuesday, June 26. Second Annual Japanese Iris Day. Dr. George M. Reed, Curator, Brooklyn Botanic Garden. Tour of the Japanese Iris Plantations.

6. Tuesday, October 30. Chrysanthemum Day. Mr. Arthur Herrington, Secretary and Manager, International Flower Show; Author of "The Chrysanthemum." "The Chrysanthemum, past and present."

These occasions, which are partly social and partly educational, increase in popularity from year to year. The approximate total attendance was 1425, an average of a little more than 237 persons per "Day." For the smoothness with which the social part of the ceremonies was conducted we are indebted as usual to the efficient services of the Woman's Auxiliary as well as to members of the Junior League and the young women of the Botanic Garden personnel.

COOPERATION WITH THE DEPARTMENT OF BOTANY OF THE DEPARTMENT OF EDUCATION, BROOKLYN INSTITUTE

As a result of a cooperative agreement between the Garden and the Department of Botany of the Department of Education, Brooklyn Institute of Arts and Sciences, a series of round table discussions was scheduled at the Garden for the second Wednesdays of November and December, 1934, and of January, February, March, and April, 1935. The programs for the two conferences held in 1934, which were well attended, were as follows:

November 14. Native Plant Gardens. Dr. H. K. Svenson, Associate Curator of Plants at the Garden, presiding.

December 12. Soils. Miss Ellen Eddy Shaw, Curator of Elementary Instruction at the Garden, presiding.

EXHIBITS

At an exhibit of the College of Pharmacy of Columbia University, from May 28 to June 2 inclusive, the following living

material was supplied by the Brooklyn Botanic Garden: Potted Plants: *Marrubium vulgare*, *Mentha piperita*, *Lycopersicum esculentum*, *Erythroxylon Coca*, *Mimosa pudica*, *Urginea maritima*, *Aloe verascens*, *Convallaria majalis*. Uprooted Plant: *Glycyrrhiza glabra*. Cut Specimens of: *Adonis* sp., *Delphinium* sp., *Ficus carica*, *Coffea arabica*, *Sassafras variifolium*, *Prunus avium*, *Rhamnus cathartica*, *Hamamelis virginiana*, *Vanilla planifolia*, *Amomum cardamon*, *Cinnamomum camphora*.

At a window exhibit of a local pharmacy, the following cut specimens of drug plants were supplied by the Garden: *Pinus Strobus*, *Hamamelis virginiana*, *Prunus serotina*, *Mentha piperita*, *Marrubium vulgare*, *Ricinus communis*, *Linum usitatissimum*, *Matricaria*, *Tanacetum vulgare*, *Coffea arabica*, *Datura Stramonium*, *Aconitum Napellus*, *Nepeta Cataria*, *Humulus Lupulus*, *Cinnamomum camphora*, *Glycyrrhiza glabra*.

For the International Flower Show at Grand Central Palace March 19-24, and the Brooklyn Fall Flower Show at the Fourteenth Regiment Armory, September 25-29, this department had charge of the docentry for the exhibits of the Garden.

EDITORIAL WORK AND PUBLICITY

As usual, I continued to serve on the board of editors of the *American Journal of Botany*, as editor of the Plant Section of General Biology for *Biological Abstracts*, as editor of the *Brooklyn Botanic Garden Contributions*, and as associate editor of the *Bulletin of the Torrey Botanical Club*. As editor of the *Brooklyn Botanic Garden Leaflets*, I report that nine numbers were issued during 1934.

During the year, 25 news releases, containing 50 articles, were prepared and sent out to the principal metropolitan newspapers. For the most part, the articles dealt with announcements of courses of instruction held at the Garden as well as news concerning the plants in the conservatories and outdoor plantations. In addition to these releases, a notice describing our Cycad collection was sent to *Science* and *Torrey*. Releases dealing particularly with the activities of the Woman's Auxiliary of the Garden were sent out through the Brooklyn Publicity Bureau. A total of 1472 press clippings relating to the Brooklyn Botanic Garden were received, as against 1495 last year.

MISCELLANEOUS ITEMS

Personal Activities of Other Members of the Department.—During the summer, Miss Hester M. Rusk, Instructor, took a six weeks intensive course in genetics at Cornell University. During her vacation, Miss Hilda Vilkomerson, Curatorial Assistant, took courses in Morphology of Vascular Plants and in Physiography of New England at Columbia University. Miss Julia E. Best, School Service Assistant, has been working on the morphogenesis of the leaf of the cotton plant. She is collaborating in this work with Dr. G. S. Avery, of Connecticut College.

Girl Scouts of Wallingford, Connecticut.—During the summer the girl scouts of Wallingford visited the chestnut trial grounds at Hamden, Conn. I, in turn, visited their camp to the north of Wallingford, and talked to them about the various kinds of native trees and shrubs in the neighborhood of their camp, and also spoke on the relative values of different timbers for fuel.

Postcard Bulletins were sent out as usual to members of the Garden: (Feb. 23) telling of the seed catalogs available for consultation in the library; (May 9) telling of the blossoming of 5000 tulips in the beds bordering the experimental plot; and (May 14) announcing the distribution to members of the Garden of 2000 young chrysanthemum plants and 1000 hardy perennials.

Cooperation with New York City Park Department.—During the summer, at the request of Mr. Nelson M. Wells, Chief Planting Designer of the New York City Park Development, I assisted in the naming of trees along a path in Central Park where it is planned to have labels affixed to each species.

Winter injury to the woody plants in the Garden.—In May and June I made a survey of the woody plants in the Garden to determine the amount of damage apparent, as a result of the severe preceding winter. The data obtained from this survey were published in the July issue of the *Botanic Garden Record*.

Bayonne Bridge Development.—In June, with Mr. W. Lynn McCracken, Secretary of the Staten Island Conservation Commission, I visited the Staten Island approach to the new Bayonne Bridge, and made recommendations for planting and development.

Brooklyn Girls Week.—In early May, in connection with the Brooklyn Girls Week, a mimeographed sheet describing the

features of the Garden was prepared for distribution to the girls on their tour of the Garden.

Boy Scout Examinations were given on April 21 for merit badges in Conservation and Botany.

Broadcasts.—Fourteen broadcasts on subjects relating to the Garden were given over WNYC during the year.

Bureau of Information.—Many inquiries of various sorts relating to plants were answered in person, by letter, or by telephone, as usual.

Research Work.—An account of the year's work on breeding the chestnut will be found on pages 59-65 of this report.

Respectfully submitted,
ARTHUR HARMOUNT GRAVES,
Curator of Public Instruction.

REPORT OF THE CURATOR OF ELEMENTARY INSTRUCTION FOR 1934

DR. C. STUART GAGER, DIRECTOR.

Sir: I hereby present my annual report for the Department of Elementary Instruction for 1934.

I would call to your attention in this report some few points in work that are significant in its progress.

My last annual report was a résumé of twenty years of work and it seemed a logical follow-up to make the keynote of our work for the visiting classes last spring the educational opportunities offered by this Garden. Letters were written to the District Superintendents in Brooklyn suggesting that at one of their meetings they place this matter before their principals, recommending that each school send to us at least one class during the spring. The regular poster which we send to schools each year had this statement on it: "These talks and walks are planned so that the boys and girls, the schools, and teachers will be better acquainted with the Brooklyn Botanic Garden and its contribution to education and to happiness in leisure hours." Over 27,000 students with their teachers visited us in school hours as a response, a response that tells its own story. All through this year we have felt results in our work of this renewed interest and

understanding of the schools. The fall work for visiting classes followed its usual lines.

Some figures from our greenhouse work might be considered in the light of progressive service. All plants used for classroom study and supply to schools were propagated in our own greenhouses. In the fall of 1934, 2,680 plants were in the greenhouses ready for fall work, an increase of 1,035 plants over 1933. Over 25,000 seedlings were raised in the spring, and nearly 600 pots of bulbs, including calla lily, Easter lily, and lily-of-the valley were planted last autumn. These figures are not so astonishing when it is known that 3,715 people, children and adults, worked in our greenhouses in 1934. This figure includes Mr. Free's classes as well as the classes in the Department of Elementary Instruction.

A course for adults in Fundamentals of Gardening during the spring, given by Miss Dorward and myself, had a registration of 99.

A great amount of material from our greenhouses is distributed to schools to aid them in their work. Over 1,500 seedlings were sent to school gardens.

The amount of study material sent out and distributed to schools has increased greatly. Two hundred twelve requests were received for such material, representing 3,860 teachers and 171,795 children. Because of the great amount of detail of this work and its time-taking element, Miss Julia Best, who assisted in the same line in the Department of Public Instruction last year, has worked with us too since October of 1934.

The appointment in elementary schools of "Nature Curators" made a great difference in the demands made upon us for conferences to plan lessons in nature study for the schools, and so we changed somewhat our Nature Study course of this year to meet these conditions. The course was planned to give direct help for classroom lessons. Beginning in the fall of 1934, thirty hours' work were given before Christmas, to be continued throughout the spring of 1935. This is an experiment to give Nature Curators a more definite training for immediate needs. This is the only Nature Study course given in this City, I believe, that is planned directly to meet this urgent need.

The seedwork has been put on a more business-like basis, but



FIG. 12. Boys in the Instructional Greenhouse working on special projects in gardening. Department of Elementary Instruction. (8654)

is much handicapped by lack of space in a small and crowded room, a mere slice cut from a larger room. Three-quarters of a million packets of seed are prepared and distributed annually.

Progress in the children's garden during the year has been along the line of student teacher training and practice. It is hoped that during this next year it will be possible to gather together and put into printed form a description of our children's work and the underlying principles upon which it is based. There is a constant and increasing educational demand for such a publication.

Throughout this year there have been certain interesting and outstanding features of work that might well come to your attention. In May the children produced a little play depicting the scope of our work and our service to schools and presented it at the Annual Luncheon of the School Garden Association. It is the custom of this organization each year to ask some school or other organization to present some feature of its work.

A meeting was held at the Garden in November of delegate students from all the school gardens of this Borough to receive the commendation which, by request of Mr. Kilpatrick, this institution each year has given.

There are three distinct sessions of our children's Saturday morning work, fall classes, spring classes, and the outdoor garden, given each year. In that period which comes immediately after Christmas and before the spring session begins, we ask back in small groups some of our honor students. This past year our work at that time came under the headings of "Fun with the Microscope" and "The Making of Wind Instruments," involving an interesting use of plant materials. This latter course was given by Miss Carleen Maley, who volunteered her services for the year to the Department of Elementary Instruction.

We have been honored by a goodly number of visitors, among them friends from abroad, including Mrs. Henry Gage Spicer, member of the London County Council; Dr. E. P. Phillips, Principal Botanist, Division of Plant Industry, Pretoria, South Africa, and Miss Elsie Knight, Principal of one of the elementary schools in London. At their request our printed forms and some of the children's work were sent to them.

Each year we have encouraged some outside gardens in their work with children, gardens with which we have had some direct contact. A medal was given to a member of the Cedarhurst School Garden, a little sister of our garden; one to the children's garden at Cornwall fostered by us; and another to the children's garden at the Brooklyn Home for Consumptives, a garden which one of our own young people has taught and conducted for some years. Two gardens for children were started at Gerritsen Beach through our work here, both of them taught and managed by our students.

This might be a fitting place and time to thank the Woman's Auxiliary for the money given to the Department, the proceeds of a lecture by Mr. McClintock. The audience was one of children, parents, and teachers. This money made it possible for us to run our children's garden this summer with greater ease and efficiency.

I would also like to thank Mrs. Charles E. Perkins, Chairman of the Woman's Auxiliary, for the donation made for special work of one of our outstanding young people. This afforded an opportunity for one of our older high school people to do some work with Dr. George M. Reed, an opportunity prized highly by our young people who think of going into botanical research.

On September 1, Miss H. Dorothy Jenkins resigned, and Miss Elsie T. Hammond, formerly at the Garden, was appointed in her place.

It has not been possible to accept some of the important requests for speaking that have come this year. The National Recreational Association Congress met in Washington in October and desired a talk on children's work. A similar request came from the Detroit Garden Club and the American Nature Study Society meeting in December with the American Association for the Advancement of Science. These are occasions at which a presentation of our work should be given.

I attended the meeting of the National Education Association in Washington as President of the Department of Science Instruction, a most successful meeting. My term of office expired with this meeting.

In October I gave a talk on the importance of junior garden

work before the presidents of the Federated Garden Clubs of New York.

One lecture was given at the American Museum of Natural History in their regular Nature Study course. It was arranged this year with Miss Farida A. Wiley, of that Museum, that we exchange lectures each year.

I have continued to act as Honorary Secretary of the National Plant, Flower and Fruit Guild; as Chairman of the Nature Craft Committee of the Camp Fire Girls, and as a member of the Advisory Board of the Horticultural College of Southern California. As I have noted before, I served as President of the Department of Science Instruction until July of 1934. I have been asked to be Consultant for the Federated Garden Clubs of New York State, and am also serving as a member of the Tufts Alumni Council and of the Editorial Board of the *Journal of the American Nature Study Society*. During the year I wrote weekly articles, as usual, for *The Sun*—thirty-nine in number—and fulfilled a great many speaking engagements as well as an increasing number of radio lectures.

Respectfully submitted,

ELLEN EDDY SHAW

Curator of Elementary Instruction.

REPORT OF THE CURATOR OF PLANTS FOR 1934

DR. C. STUART GAGER, DIRECTOR.

Sir: Herewith I submit my report for the year ending December 31st, 1934.

TREES AND SHRUBS

The increase in the number of our trees and shrubs is progressing gradually. We now have an extensive collection of woody plants and desirable additions are no longer so numerous. In a number of groups, such as poplars, maples, birches, the available space is nearly taken up. The border mound might perhaps advantageously be used for some less common species or varieties, gradually removing common maples, locusts, privets, etc. In numerous groups we now have nearly all of the more distinct species hardy in this climate. In regard to varieties, forms, and hybrids, it may be a question just where we should draw the line in the

various groups. We are experimenting in the nursery with many species of doubtful hardiness. In a severe winter such as the last, many plants were killed back, yet only very few were killed outright.

LILACS

Accurate maps locating the two hundred and thirty lilac plants west of the Rose Garden were made in the winter 1933-34. Their identification was taken up in the spring at the time of flowering. The reasonably distinct lilacs have been named and labels have been attached. Of the two hundred and thirty plants, quite a number are identical, and others very nearly so. Many of these were received under different names. Some doubtful ones have been labeled temporarily, with a view to study in 1935. The first of our lilacs were planted eighteen years ago. No special arrangement was followed in the successive plantings since that time. Many of the bushes are now overgrown. Some have been attacked by borers, or are otherwise in poor condition, so that it is now necessary to remove many of them. Of a number of our most desirable forms, cuttings grafted on privet have been started; a number of the best varieties are still lacking. The following is a brief summary:

SUMMARY OF LILAC SPECIES

	We Have	Approximate Total Number
Japonica Group.....	3	4
Vulgaris Group.....	6	17
Josikaea Group.....	7	9
	<u>16</u>	---
		About 30 (some not hardy)

SUMMARY OF LILAC VARIETIES

	B*	W†	H‡
Single White.....	8	9	7
Single Medium.....	85	53	22
Single Dark.....	27		
Double White.....	15	10	5
Double Medium.....	76	45	25
Double Dark.....	5		
	<u>216</u>	<u>117</u>	<u>59</u>

* B: Number of plants in Brooklyn Botanic Garden, including duplicates.

† W: Desirable forms according to Wister, 1927.

‡ H: " " " " Mrs. Harding, 1933.

MAPS AND LISTS

It will require another season to complete the new condensed form of maps of trees and shrubs which include the main systematic section, the lilac triangle, the ornamental *Malus* and *Prunus* section, and the nursery. On the left hand sheet facing each map are three typewritten lists:

1. Grounds, that is, plants on the map of the grounds, alphabetically arranged, giving year of accession and source.
2. Nursery, additional species and varieties not yet on the grounds.
3. Desiderata, that is, additional plants in the various groups that we wish to obtain.

IRIS

The report of Dr. George M. Reed, in charge of *Iris* plantations, will be found in the statistical report attached hereto, page 88.

COURSES

During the spring I gave ten outdoor lessons on "Ornamental Shrubs," studying about two hundred species and varieties at the time of flowering, continued with ten lessons in the fall, studying foliage and fruits.

VISITS TO OTHER INSTITUTIONS

During the spring and again in the fall, I visited the Arnold Arboretum, taking notes comparing their collections with ours. I also collected seeds, and consulted with Mr. Alfred Rehder and others. During August I visited Cornell University, consulting with Dr. K. M. Wiegand and Dr. A. J. Eames.

LABELS

Numerous labels have been put on the grounds, comparatively few trees and shrubs now remaining unlabeled.

In the case of the woody plants the labels have been simplified by omitting the hook on the lower buried end of the iron upright. The buried end was originally turned at right angles to the upright to make it difficult for "vandals" to pull up the labels. This precaution has now become unnecessary.

In the case of the lilacs, we have adopted small wooden labels painted light green with black lettering, attached to the branches by lead wire. These have the great advantage of not interfering with lawn mowers.

Statistical report is attached hereto.

Respectfully submitted,
ALFRED GUNDERSEN,
Curator of Plants.

STATISTICS RELATING TO LIVING PLANTS

Living Plants Received:

	Species or Varieties	Plants
By collection.....	7	113
By exchange.....	201	560
By gift.....	364	1,592
By purchase.....	348	4,283
By seed.....	6,470	6,470
Total.....	7,390	13,018

Living Plants Distributed:

To members.....	7,027
By gift.....	1,125
By exchange.....	<u>2,822</u>
Total.....	10,974

TALL BEARDED IRIS

Received by Exchange:

Mrs. L. W. Kellogg, Over-the-Garden-Wall, West Hartford, Conn.....	24 varieties
Mr. Robert Schreiner, Schreiner's Iris Gardens, St. Paul, Minn.....	5 "
Mr. Robert Wayman, Bayside, L. I.....	14 "
Mr. Howard Weed, Weed's National Iris Gardens, Beaverton, Ore.....	10 "
Dr. Orland E. White, University, Va.....	1 "

DWARF BEARDED IRIS AND REMONTANTS

Received by Exchange:

Mr. George L. Ehrle, Richfield, N. J.....	3 varieties
Mr. Clint McDade, Chattanooga, Tenn.....	5 "
Mr. Robert Schreiner, Schreiner's Iris Gardens, St. Paul, Minn.....	6 "

JAPANESE IRIS

Received by Exchange:

John Lewis Childs, Inc., Flowerfield, L. I. 19 varieties

MISCELLANEOUS

Mr. S. Tanaka, Shizuoka, Japan, collected and forwarded to us 4 collections of *I. Kaempferi* var. *spontanea* and 1 Japanese Iris variety.

IRIS SPECIES

Received by Exchange:

Dr. Francis Drouet, Columbia, Mo.	1 species	
Dr. R. A. Harper, Ridgewood, N. J.	3	"
Dr. H. Harold Hume, Gainesville, Fla.	2	" (11 var.)
Mr. A. E. Kunze, Birmingham, Ala.	2	" (8 ")
Dr. Fritz Lemperg, Hatzendorf, Austria	4	"
Mrs. Charles E. Perkins, Brooklyn, N. Y.	1	"
Mr. James C. Stevens, Greenville, N. Y.	2	" (4 ")
Mr. A. D. St. Romain, New Orleans, La.	2	" (9 ")
Mr. L. L. Stuart, New York, N. Y.	1	"
Dr. Orland E. White, University, Va.	1	"

LABELS AND SIGNS

Labels and signs were made by Mr. John McCallum as follows:

Galvanized iron labels for the herbaceous beds.	299
Lead labels for the woody plants.	108
Small lead labels for local flora and rock garden.	76
Small wood labels.	559
Wooden signs.	26
Large wood labels.	21
Hanging labels (lilacs).	234
Small wood markers for herbaceous beds.	183
Cardboard signs.	215

Total 1,721

Also numerous miscellaneous numbers and signs.

REPORT OF THE ASSOCIATE CURATOR OF PLANTS
FOR 1934

DR. C. STUART GAGER, DIRECTOR.

Sir: I submit herewith my report for the year ending December 31, 1934.

THE HERBARIUM

Statistics of the herbarium collections will be found at the end of this report. The most interesting acquisitions are perhaps the

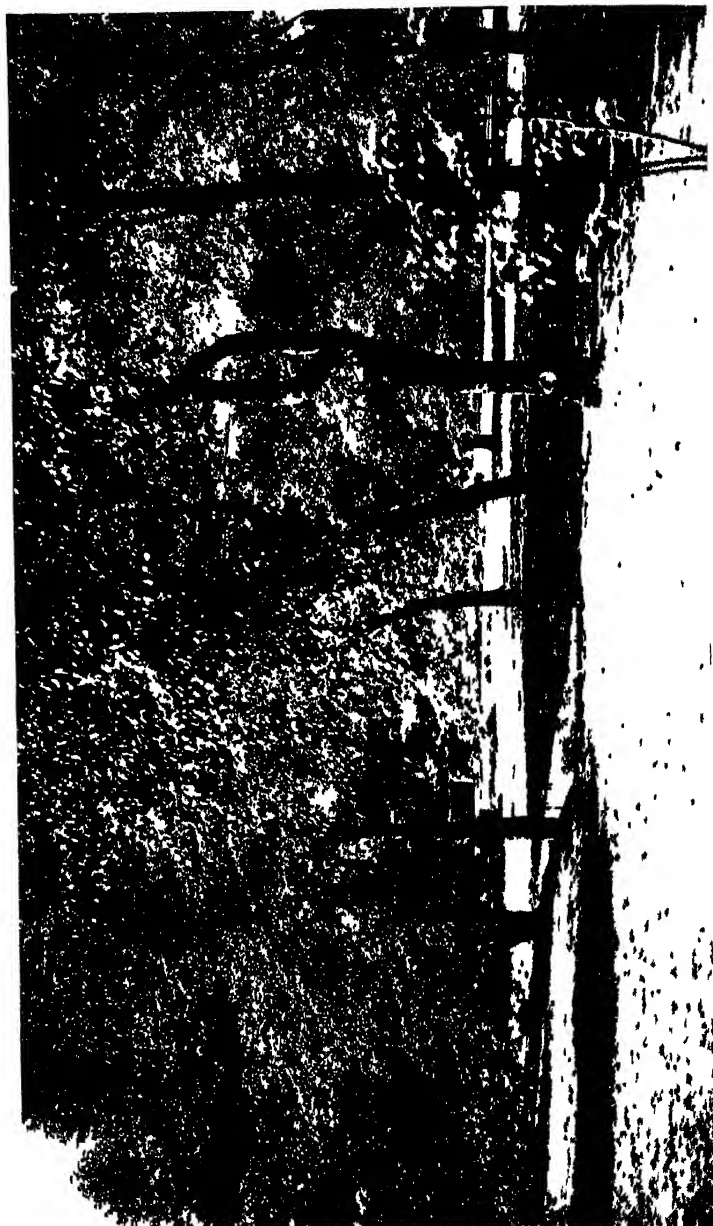


FIG. 13. Systematic Section. Willows along the Brook, planted in the fall of 1912 Facing east The hedge in the back-
ground is of *Lespedeza formosa* and *L. bicolor*. Sept 22 (8404)

collection of sedges which are being received by the Garden from many corners of the world, in exchange for the determination of material.

The herbarium is gradually being put into order, though with our limited assistance this process will take a long time. A total of 3635 specimens were mounted and 557 specimens remounted. The rather extensive collections from the Pacific Coast States, especially, have not been gone over in recent years, and most of the groups are badly in need of revision. During the past year I have rearranged in large part our collection of the extensive genus *Carex*.

Collections in 1934 totaling 1200 specimens were made by me chiefly from Long Island, the Catskill Mountains, northern New England, and the Gaspé Peninsula.

Mt. Washington in the White Mts was visited on July 3rd. The season had been early and the alpine *Rhododendron lapponicum*, *Diapensia lapponica*, and *Loiseleuria procumbens* were past bloom, but in the uppermost reaches of the Alpine Garden flowering clumps of *Cassiope hypnoides* and *Loiseleuria procumbens* were still to be found. The golden flowers of *Geum Peckii* and the large-flowered *Houstonia* of the White Mountains (*H. caerulea* var. *Faxonorum*) carpeted the mossy slopes. Labrador tea (*Ledum groenlandicum*) and the mountain sandwort (*Arenaria groenlandica*) were abundant. Each visit to the summit of Mt. Washington results in discovering some plant previously unseen by me, in this instance *Saxifraga rivularis*. In passing it may be noted that the alpine golden-rod, *Solidago Cutleri*, collected on the summit of Mt. Washington by Mr. Montague Free in 1915, has grown luxuriantly since that time in an open bed at the Botanic Garden.

Plants were collected along the estuary of the St. Lawrence River below Quebec, although the season was not sufficiently advanced to see the great variation in the genus *Bidens*, or to find the endemic gentian of these tidal shores, *Gentiana Victorinii*, which I saw on my previous visit to the St. Lawrence estuary in 1923.

It is along the newly opened road around the Gaspé Peninsula that the most spectacular plants will be seen. From Bic east-

ward, the cliffs adjacent to the sea harbor such interesting ferns as *Asplenium viride*, *Woodsia alpina* and *scopolina*, *Thelypteris fragrans* (especially abundant on the talus slopes at Cap Chat River), *Cryptogramma Stelleri*, and *Polystichum Braunii*. The wet rocky slopes at Mt. St. Louis were especially bright with the pink *Hedysarum boreale*, *Saxifraga aizoon* and *S. aizoides*, *Senecio obovatus*, and *Parnassia parviflora*. The most brilliant display, throughout areas where acid soil conditions predominated, was made by the common lamb-kill, *Kalmia angustifolia*.

LOCAL FLORA SECTION

This section may be considered as slowly approaching maturity and consequently few changes were made during the past year. Portions of the bog were becoming overgrown with grasses and the surface layer of peat in these areas was replaced. Several large boulders were added last spring to the wall which bounds the bog to the southward. These boulders should provide better shade conditions for the northern plants such as *Linnaea borealis*, *Chiogenes hispidula* and *Cornus canadensis*, which have already become well established in this locality. A pathway of stone flags has been constructed around the bog which will greatly facilitate walking. Extension of the sand-area and planting of pitch-pines is gradually making a natural background for pine-barren plants such as *Hudsonia* and *Corema* which are still thriving. Six hundred additional plants of *Trillium grandiflorum* were set out in the woodland area; the plantings of *Mertensia virginica* and of *Veratrum viride* were considerably increased. The European privet bushes and willow trees which constituted a large part of the original planting of this area are being gradually removed and replaced by native species.

Only two areas remain in an unattractive condition. One of these is the eastern end, where we still hope for a limestone wall, similar to one of the waterfall ledges in the Japanese Garden, on which walking-fern and similar plants can be grown. The other area is at the western end of the enclosure, where there is need for a landscaped pathway and a considerable amount of soil improvement.

CLASSES

Beginning January 8th six remaining sessions of the course in General Botany, as well as six sessions of the course in Plant Identification, both begun in the fall of 1933, were concluded at the Horticultural Society of New York. On October 8th a new series of fifteen sessions, a repetition of the course on Plant Identification was begun at the Horticultural Society. Nine of the fifteen scheduled meetings were given by the end of 1934; the remaining six to continue on in 1935.

Statistics from the herbarium will be found appended to this report.

Respectfully submitted,

HENRY K. SVENSON,
Associate Curator of Plants.

HERBARIUM MATERIAL BORROWED FOR STUDY

California Academy of Sciences.....	236
Copenhagen, Botaniske Museum.....	25
Field Museum of Natural History, Chicago.....	13
Gray Herbarium, Harvard University.....	63
University of Michigan, Ann Arbor.....	9
New York Botanical Garden.....	350
Philadelphia Academy of Natural Sciences.....	14
U. S. National Herbarium, Washington, D. C.....	13
Mr. Louis C. Wheeler, U. S. Forest Service, Calif.....	8
Total.....	731

HERBARIUM MATERIAL LOANED TO OTHER INSTITUTIONS

Bailey, Mr. L. H., Ithaca, N. Y.....	15
Gleason, Dr. H. A., New York Botanical Garden.....	2
Mackenzie, Mr. K. K., New York.....	3
Manning, Dr. W. E., Smith College.....	1
Moldenke, Mr. Harold N., New York Botanical Garden.....	17
Palmer, Mr. E. J., Arnold Arboretum.....	1
Pennell, Dr. F. W., Philadelphia Academy of Nat. Sciences.....	1
Total.....	40

HERBARIUM ACCESSIONS AND DISTRIBUTION

Phanerogamic Herbarium

Accessions:

By Gift:

Collin, Mrs. Louise Merritt	1,200	
Drushel, Dr. J. A.	128	
Elwert, Mr. Max A.	1	
Fitzpatrick, Mrs. M. J.	1	
Hanner, Mr. Charles C.	735	
Kittredge, Miss E. M.	6	
St. John, Mr. R. R.	18	
Svenson, Dr. Henry K.	3	2,092

By Exchange:

California, University of	174	
Deam, Mr. C. C., Bluffton, Ind.	19	
Demaree, Dr. D., Indianapolis.	174	
Fassett, Dr. Norman C., Univ. of Wisconsin.	77	
Goodgame, Mr. Allen, Essex, Mont.	2	
Gray Herbarium, Harvard University.	5	
Grover, Dr. Frederick, Oberlin College.	236	
Hotchkiss, Dr. Neil, Biological Survey, Wash., D. C.	1	
Kew, Royal Botanic Gardens, England	1	
New York Botanical Garden.	15	
Philadelphia Academy of Natural Sciences.	42	
Reeves, Prof. R. G., Agr. and Mech. College, Tex.	1	
Sharp, Mr. A. J., Univ. Tennessee.	1	
Smith College, Northampton, Mass.	204	
Thompson, Mr. J. W., Seattle, Wash.	698	
Wheeler, Mr. Louis C., U. S. Forest Service, Calif.	14	1,664

By Purchase:

Kittredge, Miss E. M., Vergennes, Vt.	52	
Schimpff, Dr. H. J. F., Ecuador.	384	
Steyermark, Mr. Julian A., St. Louis.	98	
Tharp, Prof. B. C., University of Texas.	252	786

By Collection:

Graves, Dr. A. Harmount, Brooklyn Botanic Garden.	40	40
Total.		4,582

Distribution:

By Exchange:

California, University of	111	
Denslow, Mrs. Cornelius, Brooklyn	1	
Gray Herbarium, Harvard University.	1	
Kew, Royal Botanic Gardens, England.	1	
Missouri Botanical Garden, St. Louis.	80	
Philadelphia Academy of Natural Sciences.	60	
Thompson, Mr. J. W., Seattle, Wash.	166	420

Cryptogamic Herbaria

Accessions:

Fungi:

By Exchange:

Dr. Tr. Savulescu, Bucharest, Roumania.....	200	
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By Gift:

Dr. Robert Hagelstein, Mineola, L. I.	115	
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By Purchase:

Dr. W. Migula, Eisenach, Germany.....	50	
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Dr. H. Sydow, Berlin, Germany.....	250	615
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Total.....		615
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Other Cryptogams:

By Purchase:

Dr. W. Migula, Germany.....	125	
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Fr. Verdoorn, Leiden, Holland.....	50	175
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Total.....		175
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SEED EXCHANGE

Seed Packets Received:

By Collection.....	66	
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By Exchange.....	2,179	
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By Gift.....	63	
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By Purchase.....	56	2,364
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Total.....		2,364
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Seed Packets Distributed:

By Exchange.....	3,076	
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To Members.....	912	3,988
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Total.....		3,988
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REPORT OF THE HORTICULTURIST AND HEAD
GARDENER FOR 1934

DR. C. STUART GAGER, DIRECTOR.

Sir: I submit herewith my report for the year ending December 31, 1934.

PERSONNEL

The gardening force (part of which is on the per diem payroll) was increased to ten men by the addition of one man, who, from the beginning of April, was assigned to the Local Flora Section. The collections are constantly being augmented and trees and shrubs are growing larger, necessitating the expenditure of more

labor in spraying, pruning, etc., so that this force is inadequate for the proper maintenance of the garden. If the contemplated planting of the North Addition is carried through in the spring of 1935, three additional gardeners will be urgently needed.

The laboring force suffered the loss by death on November 24 of Mr. Victor Zalewski, who had faithfully served the Botanic Garden since 1913.

LABOR PAID FOR BY CHARITABLE ORGANIZATIONS

Throughout the year, thirty-nine men, whose wages were paid by charitable organizations, worked for a total of 2,596½ days, as compared with fifty-nine men who worked for a total of 3,955½ days in 1933.

Brooklyn Bureau of Charities	39 men (8 hrs per diem)	2,471½ days
Civil Works Administration	2 " (6 " " ")	125 "

GENERAL SYSTEMATIC SECTION

The two tulip beds in the systematic section were trenched, fertilized, and replanted. The late-flowering tulips are well represented in the border along the Experimental Plot, so they were eliminated from the systematic section, their places in the west bed being taken by forty varieties of early flowering garden tulips. The east bed is given up to "wild" tulips—40 species and varieties.

Thirteen beds in the Campanulales area and nine beds in the Caryophyllales area were double dug, fertilized, and the perennial plants reset.

Because of their poor growth, the *Clethra* shrubs on the island in the terminal pool were transferred to Azalea Knoll.

The collection of *Chuenomeles* species and varieties was transferred from the eastern part of the Pomaceae area to a position near the main walk. This is one of many minor transplanting operations carried out with a view to improving the arrangement of the collections and the appearance of the Garden.

As an aftermath of the severe winter of 1933-34, five men for one week, and two men for two weeks, were engaged in pruning dead and injured wood from plants in the systematic section and elsewhere on the grounds.

JAPANESE GARDEN

In the spring, 5 White Pines, 12 Mugho Pines, and 12 Japanese Maples were planted in the Japanese Garden. In the fall, 30 Mugho Pines and 30 Japanese Yews were planted. This work was done under the direction of Miss Averill.

Much time was occupied in preventing the East Indian Lotus and Cattails from completely over-running the lake. This work was done by mowing with scythes the outskirts of the stands—the operation being conducted from a boat.

CONSERVATORIES

The collection of Stapeliads was greatly enriched by contributions from the White-Sloan Stapelia collection.

In all, species to the number of 140 were added to the cactus and succulent house, including the following varieties: *Stapelianthus Decareyi*, *Mammillaria Schumannii*, *Coryphantha Nelliae*, *Cereus vagans*, *C. Donkalaeri*, *Rhipsalis heteroclada*, *R. elliptica*, *Haworthia pallida*, *Stapelia Schinzii*, *Tavaresia grandiflora*.

ROCK GARDEN

Owing to the conditions under which it was built, the soil in the major portion of the rock garden never was properly prepared for the growth of alpine and rock plants. In the fall, a start was made to rectify this by removing the soil over a considerable area and replacing it with a mixture of stone chips, sand, soil, and humus to a depth of two and a half feet.

Over 450 feet of protective railing of cedar posts, which had decayed, was replaced with new posts.

The Federated Garden Clubs of New York State, through Mrs. William C. Meissner and Mrs. Carl L. Otto, presented the Garden with 71 species and varieties of *Sedum*, and 60 species and varieties of *Sempervivum*. These, at present, are being cared for in the cold frames, but as they are propagated they will become available for planting in the rock garden.

ROSE GARDEN

As a result of the severe winter, many of the rambler and climbing roses were severely injured, some were killed to the ground, and others killed outright.* In consequence, our display of this type of roses was nowhere near normal.

The best roses of the season were produced in August. The unusual heat of late May and early June forced the Hybrid Teas into early bloom of poor quality. The blooming season for the Hybrid Tea roses extended from May 25th to December 7th.

Massey dust for the control of fungous diseases was applied thirty times between April 25th and November 5th.

ORNAMENTAL PLANTING

Twenty flowering crab apples, which were becoming crowded in the planting west of the Japanese Garden, were transplanted to the Museum Embankment.

Over 60 named varieties of hardy Chrysanthemums were added to our collection.

The Tulip border along the fence of the Experimental Plot was trenched, and the bulbs replanted to make (we hope) a more effective display.

The sticky soil of the border west of Azalea Knoll, in which the Azaleas failed to grow, was removed and replaced with sandy soil mixed with peat moss.

NORTH ADDITION

Considerable work devolved on the laboring force as a result of the work on the North Addition by Civil Works Administration workers under the direction of our landscape architect, Mr. Harold A. Caparn. Three catch basins were moved and reset, a new catch basin installed, and over 150 feet of storm-sewer pipe laid. Over 260 feet of 2" water pipe and over 150 feet of 1" pipe was laid, and 5 faucets attached. In addition to various odds and ends of grading, over 28,000 square feet was planted with lawn seed.

MISCELLANEOUS

In the lake and along the brook, *Iris pseudacorus* had increased by self-sown seeds to such proportions that it had become a pest. Consequently, as many as possible of them were removed in the fall.

About ten tons of rock used in setting up the rock garden exhibit of the Mayfair Nurseries at the Brooklyn Fall Flower Show were transported to the Garden for use in the Local Flora Section.

These rocks were donated by Mr. Marcel Le Piniec of the Mayfair Nurseries.

Ten concrete posts were made and set to support a barbed wire fence at the south end of the Children's Garden.

A "dug-out" toolhouse, $8' \times 7' \times 5'$, was constructed of concrete in the border mound near the Rose Garden. This is for the use of men working in the northern part of the grounds.

A concrete "dug-out," $4' \times 3\frac{1}{2}' \times 3\frac{1}{2}'$, for gasoline storage, was constructed in the service yard.

About 180 feet of concrete drain pipes were laid in the garden of the Conservatory Plaza.

Broken flagstones, obtained from the Park Department, were used by lay 540 square feet of walk on Boulder Hill, and 480 square feet of walk across the Koelreuteria Triangle.

Northeast of the Japanese Garden an area of 6000 square feet of soil was graded and seeded to lawn, and an area of 4800 square feet was seeded in the vicinity of the Overlook.

EXHIBITS

At the Twenty-first Annual International Flower Show, March 19-24, the Botanic Garden's Exhibit of Methods of Pruning, covering 800 square feet of space, was awarded a Gold Medal. In connection with this exhibit, I prepared two Leaflets,* one describing the exhibit, and the other, a "double number," discussing pruning in general.

At the same Flower Show, we put up a display of about forty Crocus species and varieties covering 72 square feet for which we received a Special Prize.

A plant of *Ceratostamia mexicana* bearing a male cone was awarded a Botanical Certificate.

At the Brooklyn Fall Flower Show, September 25-29, we installed an exhibit of Xerophytic plants, covering a space $20' \times 20'$. In this exhibit 9 plant families, 54 genera and 114 species were represented. For this exhibit, we were awarded a Special First

* Brooklyn Botanic Garden *Leaflets*. Ser. XXII, No. 3-4, Mar. 21. Pruning Ornamental Trees and Shrubs.

Brooklyn Botanic Garden *Leaflets*. Ser. XXII, No. 5, Mar. 21. The Exhibits of the Brooklyn Botanic Garden at the Twenty-first International Flower Show.

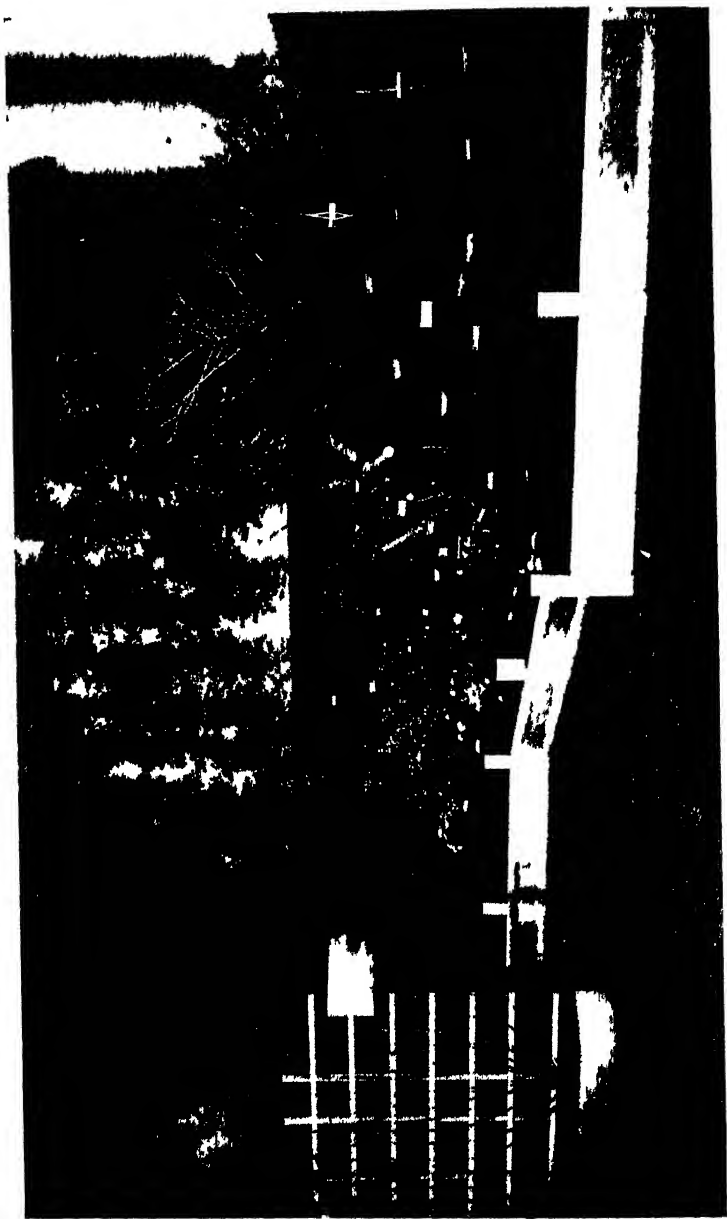


FIG. 14. Exhibit of the Garden at the International Flower Show, March 19-24, 1934. (Herbert Studies. 2270)

Prize. We also showed a miniature cactus rock garden which received a Special Prize.

At various monthly meetings of the Horticultural Society of New York, we exhibited as follows:

February 21. Tropical Rock Garden. Award of Commendation and Special Prize.

April 18. Vase of *Polygala dalmaisiana*. Award of Appreciation.

Miniature Rock Garden with *Draba Aizoon*, *Draba armata*, *Androsace carnea*. Award of Appreciation.

Demonstration of propagation of *Ficus elastica* by single eye scions grafted on piece roots, and by leaf and bud cuttings. Award of Commendation.

Collection of Cut Flowering Shrubs. First Prize.

May 16. Vase of Caucasus Bladdernut, *Staphylea colchica*. Award of Appreciation.

Vase of Manchurian Crab, *Malus baccata* var. *mandshurica*. Award of Merit.

Vase of Tulips. Third Prize.

June 20. Flat of *Leavenworthia stylosa*. Award of Commendation.

Drosera binata. Botanical Certificate.

SEED AND PLANT DISTRIBUTION

In connection with the International Seed Exchange, 3,998 packets of seeds were distributed to foreign and domestic botanic gardens and to other institutions and individuals during the spring of 1934.

Surplus plants of hardy Chrysanthemums, etc., totaling 6,200, were distributed to 330 Botanic Garden members in May.

We also supplied plants to the following public institutions:
 Pilgrim State Hospital—Cuttings of woody plants, 1,125.
 Fire Department, Telegraph Station—Tulip bulbs, 250.
 Park Department, New York—Hardy Nymphaea divisions, 2,600.

Iowa State College of Agriculture—Hardy Nymphaea divisions, 90.

COURSES OF INSTRUCTION

I conducted the following "Courses for Members and the General Public" at the Botanic Garden:

Practical Gardening. A Saturday afternoon course. Five talks with demonstrations.

Plants in the Home. Five talks with demonstrations.

PERSONAL ACTIVITIES

I acted as a judge at the following flower shows:

March 19. International Flower Show, New York City.

June 21. Horticultural Classes, Long Island Flower Show, Stony Brook.

August 2. Flower Show of the Garden Club of the Consolidated and Affiliated Gas Companies. New York City.

September 18. Federated Garden Clubs of New York State exhibits, Exhibition of the Queens-Nassau Agricultural Society. Mineola, L. I.

On September 24 I assisted in judging rose novelties in the test garden in Elizabeth Park, Hartford, for the American Rose Society.

By invitation, I attended a conference in Washington, D. C., on October 27 concerning the proposed National Rose Garden.

I was elected President of the American Rock Garden Society on March 21. The newly formed Society had its first annual meeting at the Brooklyn Botanic Garden on May 22, in conjunction with Rock Garden Day.

I was elected an Honorary Life Member of the Alpine Garden Society of England in the fall.

I continued to serve as Horticultural Consultant for the Federated Garden Clubs of New York State.

The Twentieth anniversary of my association with the Brooklyn Botanic Garden occurred in March. I want to take this opportunity of expressing my appreciation of the consideration always extended to me by the Trustees, the Governing Committee, and the Director of the Garden.

Respectfully submitted,

MONTAGUE FREE,
Horticulturist and Head Gardener.

REPORT ON THE LIBRARY FOR 1934

DR. C. STUART GAGER, DIRECTOR.

Sir: Since the librarian is still absent because of illness, the report on the library is herewith presented by the assistant in charge.

ACCESSIONS

In 1934, 619 volumes and 644 pamphlets were added to the library, which now consists of 18,525 volumes, 14,744 pamphlets, a total of 33,269 pieces. Of the year's accessions, 107 volumes, 397 pamphlets and 891 parts, including current numbers of 77 periodicals, were received as gifts.

Among the year's gifts was an autographed letter of the botanist Robert Brown, written to Sir Charles Lyell, the eminent geologist. This was presented to us by Lord Lyell and the Honorable Lady Langman, the previous owners, through the kind offices of James Cumming, County Clerk, and the Town Council of Montrose, the birthplace of Robert Brown. The letter is concerned with specimens of fossil woods which he is sending to his correspondent, and considering the scientific prominence of both men, is a most interesting item. Photographs of a bust of Robert Brown, in Montrose, were also sent us by the Town Council, to help the sculptor who was modeling one for the Brooklyn Botanic Garden, a project of the Civil Works Administration. Other gifts of special importance to us were the following:

- 62 parts and 54 pamphlets given by the American Fern Society.
- 12 volumes for the Children's Club Room, given by the Brooklyn Botanic Garden Boys' and Girls' Club.
- 10 volumes given by the Century Association, New York.
- 1 volume given by Dr. Albert Lemée, Brest, France. This was V. 5 of "Dictionnaire descriptif . . ." which has been presented by Dr. Lemée for several years.
- 44 volumes given by the Minnesota Horticultural Society.
- 36 parts of "House and Garden" given by Mrs. D. Sherman Taber, Flushing, L. I.

A complete list of donors will be found in Appendix 1.

The periodicals listed as exchanges number 757, as gifts, 77, as purchases, 136, and by publication, 7, making a total of 977

titles received during the year, two less than in 1933. Some new titles have been added to our lists, but some publications usually sent as gifts and exchanges were not issued.

LIST OF SOME IMPORTANT ACCESSIONS

Autograph Letters

Robert Brown, 1842. Stephen Hales, 1757.

Association Books

- Brown, Robert. *Prodromus florae Novae Hollandiae*. London, 1810. Author's presentation copy. Inscription on fly-leaf, "For Joseph Hooker, Esqr., with best wishes for his success and happiness from his friend R. Brown. Aug., 1829."
- Darlington, William. *Flora Cestrica*. West Chester, Penn., 1837. Author's presentation copy to Dr. F. Boott, with A.L.S. of author inserted.
- Gleditsch, J. G. *Systema plantarum a staminum situ*. Berlin, 1764. Author's presentation copy.
- Gray, Asa. *A manual of the botany of the Northern United States*. Boston, 1848. Author's presentation copy to Dr. F. Boott, with A.L.S. of author inserted.
- Torrey, John and Asa Gray. *A flora of North America*. V. 1, pt. 1. New York, 1838. G. Bentham's copy from the authors.

Pre-Linnean Works

- Bartholomaeus Anglicus. *De proprietibus rerum*. Strassburg, 1491.
- Cusa, Nicolaus de. *Opera*. 3 vols. in 2. Paris, 1514.
- Evelyn, John. *The French gardiner*. London, 1658.
- Gesner, Conrad. *Catalogus plantarum latine, graece, germanice & gallice*. Tiguri, 1542. (First edition.)
- Gmelin, J. G. *Sermo academicus de novorum vegetabilium*. . . . Tubingae, 1749. (First edition.)
- Haase, C. F. *De sexu plantarum*. Lipsiae, 1737.
- Kaempfer, Engelbert. *Histoire naturelle*. . . . du Japon. 2 vols. La Haye, 1729.
- Nollet, J. A. *Recherches sur les causes particulières des phénomènes électriques*. Paris, 1749. (First edition.)
- Parkinson, John. *Paradisi in sole*. London, 1656. (Second edition.)
- Porta, G. B. *Phytognomonica*. . . . Neapoli, 1588. (First edition.)
- Porta, G. B. *Villae libri XII*. Francofurti, 1592.
- Ruel, Jean. *De natura stirpium libri tres*. Basileae, 1537.
- Vallisneri, Antonio. *Dialoghi sopra la curiosa origine di molti insetti*. Venice, 1700.
- Zanonius, Jacobus. *Rariorum stirpium historia*. Bononiae, 1742. (First Latin edition.)

Additions to the Linnaean Collection

- Linné, Carl von. *Adonis Stenbrohultensis*. Stockholm, 1920. Reprint of the 1732 edition.
- . *Amoenitates academicae, seu dissertationes*. 7 vols. Lugduni Batavorum, 1749–69.
- . *Critica botanica . . . seu Fundamentorum botanicorum pars IV*. Lugduni Batavorum, 1737.
- . *Genera plantarum*. Holmiae, 1764. (Sixth edition.)
- . *Hortus Upsaliensis, exhibens plantas exoticas. . .* Stockholm, 1748. V. 1. (First edition.)
- . *Mantissa plantarum*. Holmiae, 1771. (Second edition.)
- . *Praelectiones in ordines naturales plantarum*. Hamburg, 1792.
- . *Reisen durch Oeland und Gothland im Jahr 1741*. Halle, 1764.
- . *Species plantarum*. 2 vols. Holmiae, 1762–63. (Second edition.)
- . *Systema naturae*. Stockholm, 1748. (Sixth edition.)
- . *Systema plantarum . . . editio novissima*. Francofurti ad Moenum, 1779–80.
- British Museum (Natural History). *Catalogue of the works of Linnaeus*. London, 1933. (Second edition.)

General Accessions

- Aiken, G. D. *Pioneering with wildflowers*. Putney, Vt., 1933.
- Allyn, R. S. *The first plant patents*. [Brooklyn, N. Y., 1934.]
- Arthur, J. C. *Manual of the rusts in United States and Canada*. Lafayette, Ind., 1934.
- Bailey, L. H. *The cultivated conifers in North America comprising the pine family and the taxads*. New York, 1933.
- . *How plants get their names*. New York, 1933.
- Baker, F. S. *Theory and practice of silviculture*. New York, 1934.
- Bean, W. J. *Trees and shrubs hardy in the British Isles*. V. 3. London, 1933.
- Bose, J. G. *Growth and tropic movements of plants*. London, 1929.
- Brown, H. P. and Panshin, A. J. *Identification of the commercial timbers of the United States*. New York, 1934.
- Buller, A. H. R. *Researches on fungi*. V. 5. New York, 1933.
- Coker, W. C. and Totten, H. R. *Trees of the southeastern states*. Chapel Hill, 1934.
- Cold Spring Harbor Symposia on quantitative biology. V. 1. 1933.
- Cooney, (Mrs.) L. M. (compiler). *Garden history of Georgia, 1733–1933*. Atlanta, Ga., 1933.
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SERVICE TO READERS

In spite of the decreased income for books, periodicals, and binding, the library has tried to serve its purpose of preserving and making readily available for scientific use current botanical literature as well as standard works. Daily routine has been simplified so that the assistants could attend to requests from the scientific staff, other institutions, members of the Garden, and the public in general, who come to the library for help, but little leeway was left for the study of library problems and no special work was undertaken this year. About 250 newly bound volumes were prepared and replaced on the shelves. Lists on various subjects, such as cross-pollination of flowers by insects, material on flower arrangement, history of garden making, the culture and use of gourds, starch formation in plants, were prepared for students, and other material was assembled on request, for the

members of the staff. As occasion arose, small exhibits were made of seed catalogs, books, illustrations, etc. Members of the American Fern Society spent one Saturday morning visiting and inspecting the library, and were interested to learn of the disposal of the fern books belonging to their association. For the lecture on Japanese Flower Arrangement, one of a course given under the auspices of the Brooklyn Botanic Garden Woman's Auxiliary, a selection of books and prints was placed in the auditorium. "Daffodil Day," April 17, was signalized by a special display of material on the origin, culture, and varieties of this flower.

INTERLIBRARY LOANS

In 1934, 55 volumes were loaned to: Abraham Lincoln High School, Brooklyn, N. Y.; Boyce Thompson Institute, Yonkers, N. Y.; Brooklyn Children's Museum; Brooklyn Museum Library; Brooklyn Public Library; Carnegie Institution of Washington, Dept. of Genetics, Cold Spring Harbor, L. I.; Columbia University Library, New York; Duke University Library, Durham, N. C.; Hunter College, New York; Iowa State College, Ames, Ia.; New Jersey Agricultural Experiment Station, New Brunswick, N. J.; New York Botanical Garden; Newark Public Library; Rockefeller Institute for Medical Research, New York; Union Carbide and Carbon Corp., New York; Vassar College Library, Poughkeepsie, N. Y.

We borrowed 46 volumes from: American Geographical Society, New York; American Museum of Natural History, New York; Brooklyn Museum Library; Brooklyn Public Library; Columbia University Library, New York; Medical Society of the County of Kings, Brooklyn, N. Y.; New York Botanical Garden; New York State College of Agriculture, Cornell University, Ithaca, N. Y.

The statistical report follows.

Respectfully submitted,

EMILIE P. CHICHESTER,
Library Assistant in Charge.

STATISTICAL REPORT ON THE LIBRARY ACCESSIONS

	Autograph Letters	Portraits	Volumes	Pamphlets	Parts (Including Periodicals)
Exchange.....	0	0	30	128	3,519
Gift	21	22	107	397	891
Publication.....	0	0	0	105	55
Purchase.....	1	9	234	14	901
By binding.....	<u>0</u>	<u>0</u>	<u>248</u>	<u>0</u>	<u>0</u>
Total.....	22	31	619	644	5,366

Total number of volumes in library, December 31, 1933.....	17,906
Number of volumes added during 1934.....	<u>619</u>
Total number of volumes in library, December 31, 1934.....	18,525
Total number of pamphlets in library, December 31, 1933.....	14,100
Number of pamphlets added during 1934.....	<u>644</u>
Total number of pamphlets in library, December 31, 1934.....	14,744
Total number of volumes and pamphlets in library, December 31, 1933	32,006
Net increase of volumes and pamphlets during 1934....	<u>1,263</u>
Total number of volumes and pamphlets in library, December 31, 1934	33,269

AMERICAN FERN SOCIETY COLLECTION

Number of volumes, December 31, 1933.....	39
Number of volumes added during 1934.....	<u>3</u>
Total number of volumes, December 31, 1934.....	42
Number of pamphlets, December 31, 1933.....	162
Number of pamphlets added during 1934.....	<u>77</u>
Total number of pamphlets, December 31, 1934.....	239
Number of parts added during 1934.....	81

SERIALS AND PERIODICALS

(Including only those of which numbers were received in 1934)

Subscription.....	136
Gift.....	77
Exchange.....	757
Publication.....	<u>7</u>
Total.....	977

CATALOGING

Books, Pamphlets, and Serials cataloged.....	772
Total number of cards typewritten and filed.....	2,080

PRINTED CARDS

Torrey Botanical Club index cards on file, December 31, 1933.	46,071
Filed during 1934.	2,029
Total, December 31, 1934.	48,100

MISCELLANEOUS

Number of users of the library	4,200
Books lent to members of the staff.	1,369
Books lent to other institutions.	55
Books borrowed from other institutions.	46

REPORT OF THE RESIDENT INVESTIGATOR (FERNS) FOR 1934

DR. C. STUART GAGER, DIRECTOR.

Sir: I submit herewith my report for the year ending December 31, 1934.

SCHOOL SERVICE

In connection with the chairmanship of the Program Committee of the New York Association of Biology Teachers and in conference with the President, Mr. Julius M. Johnson, a program has been arranged for the academic year, 1934-35. Four of the addresses are concerned largely with phases of cellular biology; viz., bacterial variation, cancer research, the mitotic figure, and structure of the plant-cell wall.

EDITORIAL WORK

During 1934, the twenty-fourth volume of the American Fern Journal was issued. Actually, the Fern Journal began its twenty-fifth year with the issuance of No. 3 of this volume.

The loan volumes of the Fern Society Library have been in considerable demand, and this service has furnished a basis for some new research—specifically, a paper on Florida ferns to be issued shortly in the pages of the Fern Journal.

There has been continued interest in the matter of technical methods of fern culture. Correspondence has been carried on with a number of Florida growers, interested to use agar nutrient medium.

CONSERVATION OF NATIVE PLANTS

There seems to be perennial interest in this topic. From time to time, correspondents write in for literature, and some of the Brooklyn Botanic Garden *Leaflets* continue to be useful material for such correspondents.

It is a matter of considerable interest to learn that the present Federal governmental projects include the establishment of sanctuary tracts. While, to a considerable extent, these are designed to serve as refuges for wild animal life, the value for the preservation of native plant species is also recognized. It has been a chief thesis of most of the conservation literature which has issued from the Botanic Garden that the establishment of sanctuaries is a matter of fundamental importance.

Respectfully submitted,

RALPH C. BENEDICT,
Resident Investigator (Ferns).

FINANCIAL STATEMENT FOR 1934

I. TAX BUDGET ACCOUNTS

1530 *Personal Service: (Regular Employees)*

1531 " " *(Temporary Employees)*

Appropriation.....	\$ 67,820.22
Expended.....	<u>67,820.22</u>

Other Codes than Personal Service:

Code 1532 Fuel Supplies:

Appropriation.....	\$ 2,500.00
Transferred from Debt Service,	
Interest on Temporary Debt.....	<u>3,133.03</u> \$ 5,633.03
Expended.....	<u>5,633.03</u>

Code 1533 Office Supplies:

Appropriation.....	\$ 400.00
Expended.....	<u>400.00</u>

Code 1534 Laundry, Cleaning and Disinfecting Supplies:

Appropriation.....	\$ 130.00
Expended.....	<u>98.19</u>
Balance, December 31, 1934.....	\$ 31.81

Code 1535 Botanical and Agricultural Supplies:

Appropriation.....	\$ 2,000.00
Expended.....	<u>1751.07</u>
Balance, December 31, 1934.....	\$ 248.93

Code 1536	Motor Vehicle Supplies:		
	Appropriation.....	\$	100.00
	Expended.....		<u>72.76</u>
	Balance, December 31, 1934.....	\$	27.24
Code 1537	General Plant Supplies:		
	Appropriation.....	\$	275.00
	Expended.....	\$	175.19
	Transf. to Code 1543.....		<u>92.40</u>
	Balance, December 31, 1934.....	\$	7.41
Code 1538	Wearing Apparel:		
	Appropriation.....	\$	1.00
	Expended.....		<u>1.00</u>
Code 1539	Office Equipment:		
	Appropriation.....	\$	50.00
	Expended.....		<u>0.00</u>
	Balance, December 31, 1934.....	\$	50.00
Code 1540	General Plant Equipment:		
	Appropriation.....	\$	1,000.00
	Expended.....		<u>882.24</u>
	Balance, December 31, 1934.....	\$	117.76
Code 1541	General Plant Materials:		
	Appropriation.....	\$	1,000.00
	Expended.....		<u>983.88</u>
	Balance, December 31, 1934.....	\$	16.12
Code 1542	Repairs and Replacements:		
	Appropriation.....	\$	2,580.00
	Expended.....		<u>2,580.00</u>
Code 1543	Light, Heat and Power:		
	Appropriation.....	\$	500.00
	Transf. from Code 1537.....		<u>92.40</u>
	Expended.....		<u>592.40</u>
Code 1544	Telephone Service:		
	Appropriation.....	\$	500.00
	Expended.....		<u>452.62</u>
	Balance, December 31, 1934.....	\$	47.38
Code 1545	Carfare:		
	Appropriation.....	\$	60.00
	Expended.....		<u>60.00</u>
Code 1546	Expressage and Deliveries:		
	Appropriation.....	\$	200.00
	Expended.....		<u>188.25</u>
	Balance, December 31, 1934.....	\$	11.75

Code 1547 General Plant Service:

Appropriation.....	\$ 400.00
Expended.....	<u>400.00</u>

Code 1548 Contingencies:

Appropriation.....	\$ 50.00
Expended.....	<u>50.00</u>

Summary of Tax Budget Accounts:

Appropriated	
Personal Service.....	\$ 67,820.22
Other Codes	
Original Appropriation.....	\$ 11,746.00
Supplemental (by transfers).....	<u>3,133.03</u>
	14,879.03
Total.....	82,699.25
Expended.....	<u>82,140.85</u>
Balance, December 31, 1934.....	\$ 558.40

II. PRIVATE FUNDS ACCOUNTS

1. *Endowment Fund (\$50,500.00) Restricted: **

Income Account:

Income 1934.....	\$ 2,020.00
Transferred to Special Contributions.....	<u>2,020.00</u>
	\$ 0.00

2. *Life Membership Fund (\$7,000.00) Restricted:*

Income Account:

Income 1934.....	\$ 280.00
Transferred to Annual Membership Account.....	<u>280.00</u>
	\$ 0.00

3. *George C. Brackett Library Fund (\$500.00) Restricted:*

Income Account:

Income 1934.....	\$ 20.00
Expended.....	<u>15.98</u>
Balance, December 31, 1934.....	\$ 4.02

4. *Benjamin Stuart Gager Memorial Fund (\$13,417.20) Restricted:*

Income Account:

Balance, January 1, 1934.....	\$ 173.95
Income 1934.....	<u>536.68</u>
	\$ 710.63
Expended.....	<u>660.95</u>
Balance, December 31, 1934.....	\$ 49.68

* Restricted funds are those limited by terms of gift, bequest, or solicitation, to the scientific and educational work of the Garden.

5. *Martha Woodward Stulzer Memorial Fund (\$10,000.00) Restricted:*

Income Account:

Balance, January 1, 1934.....	\$	119.67	
Income 1934.....		400.00	\$ 519.67
Expended.....			<u>514.56</u>
Balance, December 31, 1934.....	\$		5.11

6. *Mary Bates Spalding Fund (\$2,697.00) Restricted:*

Income Account:

Balance, January 1, 1934.....	\$	107.42	
Income 1934.....		107.88	\$ 215.30
Expended.....			<u>153.43</u>
Balance, December 31, 1934.....	\$		61.87

7. *Alfred T. White Fund (\$243,149.27) Restricted:*

Income Account:

Balance, January 1, 1934.....	\$	2,400.00	
Income 1934.....		9,725.96	\$ 12,125.96
Expended.....	\$	272.30	
Transferred to Special Contributions.....		11,625.97	<u>11,898.27</u>
Balance, December 31, 1934.....	\$		227.69

8. *A. Augustus Healy Bequest (\$9,798.31) Restricted:*

Income Account:

Income 1934.....	\$	391.92	
Transferred to Special Contributions.....			<u>391.92</u>
	\$		0.00

9. *Robert B. Woodward Bequest (\$25,000.00) Restricted:*

Income Account:

Income 1934.....	\$	1,000.00	
Transferred to Special Contributions.....			<u>1,000.00</u>
	\$		0.00

10. *Alfred T. White Memorial Tablet Fund (\$3,889.85) Restricted:*

Income Account:

Income 1934.....	\$	155.56	
Transferred to Special Contributions.....			<u>155.56</u>
	\$		0.00

11. *Brooklyn Institute Centennial Fund B.B.G. Share (\$30,000.00) Restricted:*

Income Account:

Income 1934.....	\$	1,200.00	
Transferred to Special Contributions.....			<u>1,200.00</u>
	\$		0.00

12. *John D. Rockefeller, Jr. Fund (\$250,000.00) Restricted:*

Income Account:

Balance, January 1, 1934	\$ 1,931.37	
Income 1934.....	10,000.00	
Transferred from Tuition and Sales	300.00	\$ 12,231.37
Expended.....	\$ 1,406.12	
Transferred to Special Purposes:		
(Account 21, g).....	48.46	
Transferred to Special Contributions . . .	10,751.04	12,205.62
Balance, December 31, 1934.....		\$ 25.75

13. *Citizens Endowment Fund (\$253,929.26) Restricted:*

Income Account:

Income 1934.....	\$ 10,157.15	
Transferred to Special Contributions	10,157.15	
		\$ 0.00

14. *Sustaining Membership. Restricted:*

Balance, January 1, 1934	\$ 24.99	
Received from dues.....	399.85	\$ 424.84
Transferred to Annual Membership Account.....		424.84
		\$ 0.00

15. *Annual Membership. Restricted:*

Balance, January 1, 1934.....	\$ 210.31	
Received from dues 1934.....	5,335.50	
Transferred from Life Membership Account .	280.00	
Transferred from Sustaining Membership....	424.84	
Miscellaneous Receipts.....	21.86	\$ 6,272.51
Expended.....	\$ 3,218.67	
Transferred to Special Contributions.....	1,000.00	4,218.67
Balance, December 31, 1934.....		\$ 2,053.84

16. *Tuition and Sales. Restricted:*

Balance, January 1, 1934.....	\$ 1,849.09	
Received 1934		
a. Tuitions.....	2,101.20	
b. Seed Packets.....	8,402.40	
c. Sales.....	440.22	
d. Miscellaneous.....	283.01	\$ 13,075.92
Expended.....	\$ 3,896.57	
Transferred to Special Contributions.....	5,459.90	
Transferred to J. D. Rockefeller, Jr. Fund . .	300.00	9,656.47
Balance, December 31, 1934.....		\$ 3,419.45

17. *Botanic Garden Collections Fund. Restricted:*
- | | | | |
|--|----|----------|-------------|
| Balance, January 1, 1934 | \$ | 289.01 | |
| Received from Contributions..... | | 5,807.50 | |
| Miscellaneous..... | | 269.89 | \$ 6,366.40 |
| Expenditures..... | \$ | 3,055.84 | |
| Transferred to Special Contributions | | 3,300.00 | 6,355.84 |
| Balance, December 31, 1934..... | \$ | | 10.56 |
18. *Cary Library Fund (\$10,000.00—1/5 of Income to Brooklyn Botanic Garden) Restricted:*
- | | | | |
|---------------------------------|----|-------|-----------|
| Balance, January 1, 1934..... | \$ | 63.70 | |
| Income Allotment 1934..... | | 80.00 | \$ 143.70 |
| Expenditures..... | | | 142.90 |
| Balance, December 31, 1934..... | \$ | | .80 |
19. *Henry W. Healy Trust Fund (\$231,977.17—1/4 of Income to Brooklyn Botanic Garden) Restricted:*
- | | | | |
|---|----|----------|-------------|
| Balance, January 1, 1934..... | \$ | 0.00 | |
| Income 1934..... | | 1,668.00 | \$ 1,668.00 |
| Transferred to Special Contributions..... | | | 1,653.00 |
| Balance, December 31, 1934..... | \$ | | 15.00 |
20. *Mrs. Henry C. Folger Fund (\$1,000.00) Restricted:*
- Income Account:
- | | | | |
|---------------------------------|----|-------|----------|
| Balance, January 1, 1934..... | \$ | 0.00 | |
| Income 1934..... | | 40.00 | \$ 40.00 |
| Expenditures..... | | | 0.00 |
| Balance, December 31, 1934..... | \$ | | 40.00 |
21. *Special Purposes. Restricted by Terms of Gifts:*
- | | | | |
|---|----|----------|-------------|
| Balance, January 1, 1934..... | \$ | 1,040.94 | |
| Received: | | | |
| a. Special Gifts for Children's Work..... | | 301.25 | |
| b. Test Garden, Japanese Iris..... | | 4.00 | |
| c. Victory Maples..... | | 50.00 | |
| d. Compensation of Landscape Architect: | | | |
| Improvement of Auditorium..... | | 1,300.00 | |
| e. Planting North Addition..... | | 650.00 | |
| f. Miscellaneous..... | | 15.00 | |
| g. Transf. from J. D. Rockefeller, Jr. Fund | | | |
| (for Japanese Garden)..... | | 48.46 | \$ 3,409.65 |
| Expenditures..... | | | 1,253.07 |
| Balance, December 31, 1934..... | \$ | | 2,156.58 |
22. *Plant Pathology Research Fund. Restricted:*
- | | | | |
|---|----|----------|-------------|
| Balance, January 1, 1934..... | \$ | 478.35 | |
| Income 1934..... | | 6,250.00 | \$ 6,728.35 |
| Expenditures..... | \$ | 492.57 | |
| Transferred to Special Contributions..... | | 6,200.00 | 6,692.57 |
| Balance, December 31, 1934..... | \$ | | 35.78 |

23. *Special Contributions (for 1934 only) Restricted:*

Balance, January 1, 1934	\$	1,548.56	
Salary Rebate		200.00	
Miscellaneous		623.75	
Transferred from			
Endowment Fund Income Account		2,020.00	
Alfred T. White Fund Income Account . . .		11,625.97	
A. Augustus Healy Bequest Income Account		391.92	
R. B. Woodward Bequest Income Account . . .		1,000.00	
A. T. White Memorial Tablet Fund Income Account		155.56	
Brooklyn Institute Centennial Fund Income Account		1,200.00	
J. D. Rockefeller, Jr. Fund Income Account . . .		10,751.04	
Citizens Endowment Fund Income Account . . .		10,157.15	
Annual Membership Account		1,000.00	
Tuition and Sales, Public Instruction		459.90	
" " " Elementary Instruction		5,000.00	
Collections Fund		3,300.00	
Henry W. Healy Trust Fund		1,653.00	
Plant Pathology Research Fund		6,200.00	\$ 57,286.85
Expended			55,783.87
Balance, December 31, 1934	\$		1,502.98

24. *Endowment Increment Fund (\$130,064.31) Restricted:*

Interest 1934	\$	5,075.05
Transferred to Principal		5,075.05
	\$	0.00

Summary of Private Funds Accounts:

Balances, January 1, 1934	\$	10,237.36	
Income 1934		75,313.63	\$ 85,550.99
Expended	\$	70,866.83	
Transferred to Endowment Increment Fund			
Principal		5,075.05	75,941.88
Balances, December 31, 1934	\$		9,609.11

NOTE: The book value total of the principal of all Private Funds as of December 31, 1934, is \$1,090,939.49.

III. SUMMARY OF TOTAL MAINTENANCE BUDGET FOR 1934

Income

Tax Budget Appropriation, 49.2%	\$	82,699.25
Private Funds Budget, 50.8%		85,550.99
Total		\$168,250.24
Transferred to Endowment Increment Fund Principal . . .		5,075.05
Available		\$163,175.19

Expended

Personal Service		
Tax Budget	\$ 67,820.22	
Private Funds	<u>55,783.87</u>	
Total		\$123,604.09
Other than Personal Service		
Tax Budget	\$ 14,879.03	
Private Funds	<u>15,082.96</u>	
Total	\$ 29,961.99	<u>\$153,566.08</u>
Balance, December 31, 1934		\$ 9,609.11

Respectfully submitted,

DANIEL C. DOWNS,
Secretary and Accountant.

Note: The above "Financial Statement" is a transcript of Brooklyn Botanic Garden accounts in the books of the Treasurer of the Brooklyn Institute of Arts & Sciences. The Treasurer's accounts are audited annually by a Public Accountant, and a separate audit of this "Financial Statement" is not made in order to save unnecessary expense.

EDWIN P. MAYNARD,
Treasurer.

APPENDIX I

GIFTS RECEIVED DURING 1934

Collections Fund

Mrs. Frank L. Babbott	Mrs. William W. Marshall
Edward C. Blum	Mrs. Edwin P. Maynard
Mrs. Edward C. Blum	Mrs. Charles F. Noyes
Mrs. Armin E. Brunn	Mrs. Charles E. Perkins
Mrs. Glentworth R. Butler	James H. Post
Mrs. S. Parkes Cadman	Mrs. James H. Post
Mrs. Walter V. Cranford	Mrs. Frederic B. Pratt
Mrs. Mary Childs Draper	Harold I. Pratt
Mrs. C. I. De Bevoise	William A. Putnam
Dugan Brothers	Mrs. William A. Putnam
Otto Ebel	Mrs. Seth Thayer Stewart
Miss Adele F. Emerson	Miss Elise W. Stutzer
Mrs. William Emerson	Mrs. Mary Van Norden
Gates D. Fahnestock	Mrs. R. C. Weithas
Fortnightly Club	Mrs. Alexander M. White
A Friend	Miss Frances E. White
John W. Frothingham	Miss Harriet H. White
William T. Hunter	Peter Piper Wright (A dog)
Miss C. Julie M. Husson	Miss Abigail Young
Miss Hilda Loines	

Special Gifts for Children's Work

Woman's Auxiliary, B. B. G.....	\$ 266.25
Mrs. Charles E. Perkins.....	25.00
Parent Teachers Association of P. S. 117.....	10.00

Beardless Iris Project

Miss Helen Adams Paffard.....	\$ 2.00
Miss Eleanor Parry.....	2.00

Victory Maples

Battle Pass Chapter, N. S. D. A. R.....	\$ 50.00
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Landscaping, Auditorium, etc.

Woman's Auxiliary, B. B. G.....	\$ 1,000.00
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Planting the North Addition

Woman's Auxiliary, B. B. G.....	\$ 650.00
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Miscellaneous

Women of '76 Chapter, N. S. D. A. R.....	\$ 15.00
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Library

Books

Black, Hon. Loring M., Jr., Washington, D. C.....	1
Brooklyn Botanic Garden Boys' and Girls' Club.....	12
Brooklyn Plant, Flower and Fruit Guild, Brooklyn, N. Y.....	1
Century Association, New York, N. Y.....	10
DuVal, Mr. Guy, Brooklyn, N. Y.....	1
Fairbanks, Miss M. B., Brooklyn, N. Y.....	1
Gager, Dr. C. Stuart, Brooklyn, N. Y.....	22
Hecht, Miss Sadie, New York, N. Y.....	1
Hottes, Mr. Alfred C., Des Moines, Iowa.....	2
Lemée, Dr. Albert, Brest, France.....	1
Levine, Mrs. Dorothy, Brooklyn, N. Y.....	1
Massachusetts Agricultural College Library, Amherst, Mass.....	1
Minnesota Horticultural Society, St. Paul, Minn.....	44
Penna, Señor Leonam de Azeredo, Rio de Janeiro, Brazil.....	1
Pierpont Morgan Library, New York, N. Y.....	1
Shaw, Miss Ellen Eddy, Brooklyn, N. Y.....	1
Smalley, Mrs. Arthur, Brooklyn, N. Y.....	1
Smithsonian Institution, Washington, D. C.....	1
Stoll, Mr. Frank, Brooklyn, N. Y.....	1
Sutcliffe, Miss Alys, Brooklyn, N. Y.....	1
Total.....	105

PAMPHILETS

American Antiquarian Society, Worcester, Mass.....	1
American Fern Society.....	54
Ames, Professor Oakes, Cambridge, Mass.....	1
Baur, Professor Erwin, Munchelberg, Germany.....	3
Benedict, Dr. Ralph Curtiss, Brooklyn, N. Y.....	2
Bojko, Dr. Hugo, Vienna, Austria.....	1
Boydston, Mrs. Kathryn E., River Forest, Ill.....	1
Braun, Miss E. Lucy, Cincinnati, Ohio.....	2
Carnegie Institution of Washington, Washington, D. C.....	4
Carnegie Institution of Washington, Dept. of Genetics, Cold Spring Harbor, L. I.....	29
Cheney, Dr. Ralph Holt, Brooklyn, N. Y.....	11
Chichester, Mrs. Emilie P., Brooklyn, N. Y.....	1
Cornell University, Dept. of Plant Pathology, Ithaca, N. Y.....	23
Dachnowski-Stokes, Dr. A. P., Washington, D. C.....	4
Dinsmore, Mr. John Edward, American University of Beirut, Syria.....	3
Dowd, Mr. Daniel, Norwood, Ohio.....	1
Edgars, Mr. Norman K., Tenaafly, N. J.....	1
Eidlitz, Mrs. Ernest Frederick, New York, N. Y.....	1
Erlanson, Miss Eileen Whitehead, London, England.....	1
Evans, Mr. Herbert M., Berkeley, Cal.....	1
Fosberg, Mr. F. Raymond, Honolulu, Hawaii.....	3
Free, Mr. Montague, Brooklyn, N. Y.....	6
Gager, Dr. C. Stuart, Brooklyn, N. Y.....	121
Goldring, Miss Winifred, Albany, N. Y.....	2
Hansel, Mrs. Dorothy Ebel, New York, N. Y.....	1
Helbrun, Miss Margaret, Cambridge, Mass.....	1
Hitchcock, Dr. A. S., Washington, D. C.....	1
Institut Botanique Agricole et Colonial de Nancy, France.....	1
LePrince, Miss G. Marie, New York, N. Y.....	1
Linnean Society of London, London, England.....	1
Lloyd, Professor Francis E., Montreal, P. Q.....	5
Loines, Miss Hilda, Brooklyn, N. Y.....	1
Long Island Chamber of Commerce, New York, N. Y.....	1
Looser, Mr. Gualterio, Santiago, Chile.....	1
Maheshwari, Dr. P., Agra, India.....	2
Medical Society of the County of Kings, Brooklyn, N. Y.....	2
Meller, Professor H. B., Pittsburgh, Pa.....	7
New York State Museum, Albany, N. Y.....	1
Pennsylvania, University of, Zoological Laboratory, Philadelphia.....	2
Robinson, Professor B. L., Cambridge, Mass.....	1
Rockefeller Institute for Medical Research, New York, N. Y.....	17
Rohde, Miss Eleanour Sinclair, London, England.....	1
Ross, Dr. William H., Brentwood, L. I.....	2
Rübel, Dr. Eduard, Zürich, Switzerland.....	1

Saunders, Miss Edith R., Cambridge, England.....	4
Savulescu, Dr. Tr., Bucuresti, Roumania.....	9
Seward, Professor A. C., Cambridge, England.....	1
Shreve, Dr. Forrest, Tucson, Ariz.....	1
Smith, Dr. Hay Watson, Little Rock, Ark.....	2
Spingarn, Mr. J. E., Amenia, N. Y.....	2
Struckmann, Mr. Erick, Copenhagen, Denmark.....	2
Svenson, Dr. Henry K., Brooklyn, N. Y.....	1
Tilden, Dr. Josephine E., Minneapolis, Minn.....	8
Utter, Mr. Gordon, Brooklyn, N. Y.....	2
van Melle, Mr. P. J., Poughkeepsie, N. Y.....	1
Went, Dr. Johanna C., Wassenaar, Holland.....	1
Woodleton, Mrs. Helen S., Brooklyn, N. Y.....	5
Zillig, Dr. Hermann, Berncastel-Cues/Mosel, Germany.....	13
Total.....	379

PARTS OF PUBLICATIONS

(Exclusive of Government Documents)

American Fern Society.....	62
American Horticultural Society, Washington, D. C.....	4
American Scenic and Historic Preservation Society, New York, N. Y.....	1
American Sugar Refining Company, New York, N. Y.....	1
American Tree Association, Washington, D. C.....	1
Ames, Professor Oakes, Cambridge, Mass.....	11
Basic Science Research Laboratory, Cincinnati, O.....	1
Behning, Dr. A. L., Aralsk, U. S. S. R.....	6
Benedict, Dr. Ralph Curtiss, Brooklyn, N. Y.....	1
British Honduras. Conservator of Forests, Belize.....	1
Cambridge, University of. Botanic Garden Syndicate, Cambridge, England.....	1
Carnegie Institution of Washington, Washington, D. C.....	1
Carnegie Institution of Washington, Dept. of Genetics, Cold Spring Harbor, L. I.....	2
Cattell, Professor J. McKeen, New York, N. Y.....	2
Colorado, University of, Boulder, Col.....	2
Eastwood, Miss Alice, San Francisco, Cal.....	1
Eidlitz, Mrs. Ernest Frederick, New York, N. Y.....	1
Fisher Scientific Company, Pittsburgh, Pa.....	3
Florida Entomological Society, Gainesville, Fla.....	3
Flushing Garden Club, Inc., Flushing, L. I.....	1
Free, Mr. Montague, Brooklyn, N. Y.....	10
Gager, Dr. C. Stuart, Brooklyn, N. Y.....	33
General Biological Supply House, Chicago, Ill.....	12
Genetics Society of America.....	1
Giardino Botanico Alpino dell' Ordine Mauriziano, Turin, Italy.....	1

Graves, Dr. Arthur Harmount, Brooklyn, N. Y.....	1
Hawaii, University of, Honolulu, Hawaii.....	1
Idaho, University of, School of Forestry, Moscow, Idaho.....	1
Imperial Bureau of Plant Genetics, Aberystwith, Wales.....	2
Jenkins, Mr. Charles F., Germantown, Pa.....	3
McFarland Organizations, Harrisburg, Pa.....	1
Medical Society of the County of Kings, Brooklyn, N. Y.....	13
Meguro Forestry Experimental Station, Tokyo, Japan.....	1
Michigan, University of, School of Forestry and Conservation, Ann Arbor, Mich.....	2
Missouri State Museum, Jefferson City, Mo.....	3
Nanking University, College of Agriculture and Forestry, Nanking, China	9
National Research Council, Ottawa, Canada.....	2
National Research Council, Washington, D. C.	1
National Research Council of Japan, Tokyo, Japan.....	2
New Jersey Horticultural Society, New Brunswick, N. J.....	6
New York Public Library.....	6
Ohara Institute for Agricultural Research, Kurashiki, Japan.....	1
Pyle, Mr. Robert, West Grove, Pa.....	1
Ramaley, Dr. Francis, Boulder, Col.....	1
Reed, Dr. George M., Brooklyn, N. Y.....	48
Rockefeller Institute for Medical Research, New York, N. Y.....	2
Roosevelt Wild Life Forest Experiment Station, Syracuse, N. Y.....	2
School Garden Association, New York, N. Y.....	6
Smithsonian Institution, Washington, D. C.....	2
Sociedad Española de Historia Natural, Madrid, Spain.....	12
Southern Methodist University, Dallas, Texas.....	2
Stanford University, Cal.....	2
Struckmann, Mr. Erick, Copenhagen, Denmark.....	1
Taber, Mrs. D. Sherman, Flushing, L. I.....	36
Taihoku Imperial University, Formosa, Japan.....	1
Tohoku Imperial University, Sendai, Japan.....	4
Towson Nurseries, Towson, Md.....	2
Utter, Mr. Gordon, Brooklyn, N. Y.....	2
West Virginia Academy of Science, Morgantown, W. Va.....	1
Wild Flower Preservation Society, Inc., Washington, D. C.....	5
Woodleton, Mrs. Helen S., Brooklyn, N. Y.....	22
Yale University, School of Forestry, New Haven, Conn.....	5
Total.....	375

PORTRAITS AND PHOTOGRAPHS

Bessey, Professor Ernst A., East Lansing, Mich.....	1
Burgess, Mrs. Edward Sanford, Yonkers, N. Y.....	1
Edinburgh, Royal Botanic Garden, Scotland (Print: View of Edinburgh).	1
Free, Mr. Montague, Brooklyn, N. Y.....	1
Gundersen, Dr. Alfred, Brooklyn, N. Y.....	3

Council of the Linnean Society of London, England.....	1
Town Council of Montrose, Forfarshire, Scotland.....	2
Novani, Mr. Giulio, New York, N. Y.....	1
Phillips, Dr. E. Percy, Praetoria, South Africa.....	1
Plonski, Mr. W. D., New York, N. Y.....	3
Schmitz, Mr. Carl L., New York, N. Y.....	4
Shull, Dr. George H., Princeton, N. J.....	1
Zahlbruckner, Dr. A., Vienna, Austria.....	1
Total.....	21

AUTOGRAPH LETTERS

Gager, Dr. C. Stuart, Brooklyn, N. Y.....	20
Lyell, Baron and Hon. Lady Langman, London, England.....	1
Total.....	21

MISCELLANEOUS

Chichester, Mrs. Emilie P., Brooklyn, N. Y.	1 Map of Asia.
New York State Library, Albany, N. Y.	1 Geological Map of New York State.
Socony Touring Service, New York, N. Y.	6 Maps (New York, New Jersey, New England, etc.).
Yamanaka & Company, New York, N. Y.	1 Diagram of Japanese Flower Arrangement.

Living Plants

Agnew, Miss E. T., Montauk, L. I.,	3 <i>Arctostaphylos Uva-ursi</i> , 4 <i>Cypripedium acaule</i> , 8 <i>Hieracium venosum</i> , 1 <i>Hudsonia tomentosa</i> , 1 <i>Linaria canadensis</i> .
Andorra Nurseries, Inc., Chestnut Hill, Philadelphia,	100 scions of <i>Acer platanoides</i> var. <i>palmatifidum</i> .
Becker, Mr. Herman, Brooklyn, N. Y.,	113 plants comprising 87 varieties of cacti, <i>Stapeliads</i> and succulents.
Burpee, W. Atlee Co., Philadelphia,	12 cuttings of <i>Nasturtium</i> .
Conard Pyle Co., West Grove, Pa.,	9 roses in 5 varieties.
Elwert, Mr. Max., Red Hook, N. Y.,	50 seedlings of <i>Lobelia cardinalis</i> .
Fener, Mrs., Brooklyn,	2 <i>Sarracenia purpurea</i> .
Gerber, Mr. Charles N., Brooklyn,	1 plant Winesap Apple.
Haartz, Mr. John C., Compton, N. H.,	2 bulbs of <i>Ornithogalum aureum</i> .
Heath, Mr. Royal V., New York,	1 <i>Euphorbia natalensis</i> .
Ilecht, Miss Sadie, New York,	5 plants from Texas, comprising 3 species.
Henry, Mrs. J. Norman, Gladwyne, Pa.,	50 seedlings of <i>Stapelia cantabrigiensis</i> .
Jackson & Perkins Co., Newark, New York,	68 roses in 14 varieties.
Kerr, Mrs. Ellen Van Norden, Spring Valley, N. Y.,	1 <i>Crassula Schmidtii</i> .
Kovac's Nursery, Purchase, N. Y.,	4 rose varieties.
Lemmon, Mr. Robert S., New York,	1 <i>Polystichum Lemmoni</i> .
Long, Mrs. Walter P., Brooklyn,	21 plants in 6 species.
Macrum, Mr. E. K., Brooklyn,	1 seedling of <i>Araucaria imbricata</i> .

- McKee, Mr. Frank, Brooklyn, 1 *Rhododendron*.
 Michal, Mr. A., West Orange, N. J., 1 *Globularia trichosantha*.
 New York State, Federated Garden Clubs of, 139 plants comprising 131 species of *Sedum* and *Sempervivum*.
 Perkins, Mrs. Charles E., Brooklyn, 1 *Cypripedium hirsutum*, 1 *Orchis spectabilis*.
 Regan, Mrs. W. J., Butte, Montana, 33 species of rock garden plants.
 Rodman, Mr. F. C., Brooklyn, 930 tubers and bulbs, comprising 11 species of *Anemone*, *Crocus*, *Narcissus*, etc.
 Schwartz, Mrs. Leonard, Brooklyn, 1 *Galax aphylla*.
 Seymour, Mr. C. Lansing, Proctor, Vermont, 28 species of *Sedum*.
 Swedroe, Mr. Paul, New York, 6 *Begonia* species.
 Tricker, William, Inc., Saddle River, N. J., 38 species of tropical water lilies.
 Tuthill, Miss I. H., Brooklyn, 1 *Chrysanthemum* "Garza," 6 double sweet *Viola*.
 Whiting, Mrs. F. L., Chatham, N. J., 12 *Opuntia vulgaris*.
 Whitney, Mrs. Elsie G., Albany, N. Y., 5 species of ferns.

Seeds

- | | |
|-----------------------------------|----------------------------|
| American Amaryllis Society (1) | Mrs. William Hand (2) |
| Mrs. Florence H. Barber (1) | Miss Sadie Hecht (1) |
| Mrs. Harold D. Barstow (1) | Dr. C. T. Hilton (1) |
| Mr. Herman Becker (10) | Mr. F. G. Knowlton (1) |
| Miss Mary Bell (17) | Miss Hilda Loines (5) |
| Mr. A. G. Bergner (1) | Mr. George W. Park (19) |
| Mr. A. Barnhardt (1) | Miss M. Helen Smith (1) |
| Dr. Leon Croizat (1) | Mrs. D. Shearman Taber (1) |
| Great Southern Lumber Company (1) | Dr. C. H. Townsend (1) |

Phanerogamic Herbarium

- Collin, Mrs. Louise Merritt, 1200 specimens from the United States and Canada.
 Drushel, Dr. J. A., 128 specimens from the United States.
 Elwert, Mr. Max A., 1 *Gerardia tenuifolia* var. *alba*.
 Fitzpatrick, Mrs. M. J., 1 *Margyricarpus setosus*.
 Hammer, Mr. Charles C., 735 specimens from Fishers Island and Nova Scotia.
 Kittredge, Miss E. M., 6 specimens from Vermont.
 St. John, Mr. R. P., 18 specimens of ferns from Florida.
 Svenson, Dr. H. K., 3 specimens from New England.

Cryptogamic Herbarium

- Dr. Robert Hagelstein, Mineola, N. Y., 115 specimens of Myxomycetes.

Miscellaneous

Ford, Dr. E. S., 1 photograph of *Botrychium virginianum*.

For the Department of Elementary Instruction

- Boys' and Girls' Club, Twelve books for the children's clubroom library.
 Brooklyn Section, New York Public School Kindergarten Association, \$10.00 for the work of the Department.
 Brunswick, Master Sanford, \$1.00 for the children's clubroom library.
 Butler, Mrs. Glentworth R., One globe for the children's clubroom. One prize cup competed for by the girls in the outdoor garden.
 Gager, Dr. C. Stuart, One book for the children's clubroom library.
 Goodman, Mr. and Mrs. Joseph, One cup competed for by the boys in the outdoor garden.
 Hecht, Miss Sadie, One book for the children's clubroom library.
 Hottes, Mr. Alfred C., Two publications for the children's garden house.
 Individual Drinking Cup Company, One set of the "Dixie Nature Series" (pictures) for use in classwork.
 Kirk, Miss Isabel, Fifty seedlings of spider plant and Ampelopsis.
 Levine, Mrs. Joseph, One book for the children's garden house.
 Miner, Miss Frances M., One flower bowl for the children's garden house.
 Perkins, Mrs. Charles E., \$25.00 honorarium for children's garden work.
 Phillips, Dr. E. Percy, One book for the children's clubroom library.
 Public School 117, Queens, Parent-Teachers Association, \$10.00 for the children's work.
 Public School 225 Mothers' Club, One flower bowl for the children's clubroom.
 Shaw, Miss Ellen Eddy, One book for the children's clubroom library. Four gold honor pins for service in the outdoor garden. One pewter cup as award for children's work.
 Smalley, Mrs. Arthur, One book for the children's garden house.
 Stern, Mr. Herman, One motion picture reel of work in the children's garden.
 Stoll, Mr. Frank, One book for the children's clubroom library.
 Sutcliffe, Miss Alys, One book for the children's clubroom library.
 United States National Museum, One set of minerals for use in classwork.

Miscellaneous

- Brooklyn Flower Show, Inc., 100 Cedar trees suitable for poles.
 Mrs. George Stewart Brown, Brooklyn, 1 fossil of *Lepidodendron*.
 Mrs. Glentworth R. Butler, Brooklyn, 29 specimens of wood of different trees.
 Dr. M. Davidson and Dr. L. Landau, Kingston Avenue Hospital, Brooklyn, 7 stained slides of pathogenic bacteria.
 Mrs. Ernest F. Eidlitz, New York City, 1 photograph of Japanese Day in Flower Arrangement Course, 1934.
 Mrs. Clarence R. Hyde, Brooklyn, 1 steps-stand for seed exhibit.
 Mr. Marcel le Piniec, Bergenfield, N. J., 15 tons of weathered granite.

- Miss G. Marie Le Prince, New York City, 1 hanging vase of Inwood pottery.
 Mr. Giulio Novani, New York City, 1 photograph of night-blooming *Cereus*.
 Mrs. William Sterling Peters, Brooklyn, 1 vase and 1 bronze flower container.
 Royal Botanic Garden, Edinburgh, Scotland, print of Old Physic Garden,
 Edinburgh.
 Mr. Preston King Sheldon, Flushing, N. Y., 5 photographs of Flushing Cedar
 of Lebanon.
 Miss Jacqueline Smith, Brooklyn, 60 70 "Swordfin" Guppies, with a quantity
 of various aquatic plants and 2 cans of fish food.
 Mr. George Warren Stetson, Boston, Mass., 6 photographic prints.
 Mr. E. Vermilya, Brooklyn, 2 Paradise fish.
 Mrs. Elsie Gibson Whitney, Albany, N. Y., 2 lantern slides of *Asplenium*
Ruta-muraria.

APPENDIX 2

PUBLICATIONS BY THE BOTANIC GARDEN PERSONNEL DURING 1934

Becker, Herman.

- The Brooklyn Botanic Garden's Succulent Display. *Cactus and Succulent Journ.* 6: 44-45. September.
 Review: Zander, Robert. Grosses Garten-Lexikon, Reichilustrierter Ratgeber für Gärtner und Gartenfreunde. *Florists Exchange* 82: 12. June 23.

Benedict, Ralph C.

- Review: Ching, R. C. The studies of Chinese ferns, VIII. (*Sinensia* 3: 131-156. November, 1932.) *Amer. Fern Jour.* 24: 17. January-March.
 Review: Ching, R. C. The studies of Chinese ferns, IX. (*Bull. Fan Memorial Institute of Biology* 4: 47-116. February, 1933.) *Amer. Fern Jour.* 24: 17-18. January-March.
 Review: Ching, R. C. The present status of our knowledge of Chinese ferns. (*Peking Natural History Bull.* 33: 253-273. 1932.) *Amer. Fern Jour.* 24: 18. January-March.
 Review: Tatewaki, M. The phytogeography of the Middle Kuriles. (*Jour. Facul. Agr., Hokkaido Imperial University.* Vol. 29, Pt. 5, 1933.) *Amer. Fern Jour.* 24: 18. January-March.

Review: Small, John K. Native ferns in the New York Botanical Garden. (*Jour. N. Y. Bot. Gard.* 35: 148-151. 1934.) *Amer. Fern Jour.* 24: 114-115. October-December.

Review: Small, John K. Ferns within one hundred miles of New York City. (*Jour. N. Y. Bot. Gard.* 35: 197-207. 1934.) *Amer. Fern Jour.* 24: 114-115. October-December.

Can anyone readily distinguish the northern and southern lady fern species? *Amer. Fern Jour.* 24: 117-119. October-December.

Advice on preparation for high school biology teaching examination. A letter to Mr. Edgar Zwilling, Pres., Biology Alumni of Brooklyn College. *Biology Alumni of Brooklyn College Bull. No. 1.* December 27.

Cheney, Ralph H.

Relation of Caffeine and Coffee to Human Efficiency. *Jour. Amer. Pharm. Assoc.*, 23: 143. February.

A Simplified Psychodometer. *Jour. Lab. and Clin. Med.* 19: 1238. August.

Free, Montague

Pruning ornamental trees and shrubs. *Brooklyn Bot. Gard. Leaflets XXII*³⁻¹. March 21.

The exhibits of the Brooklyn Botanic Garden at the Twenty-first International Flower Show, March 19-24. *Brooklyn Bot. Gard. Leaflets XXII*⁵. March 21.

Report of the Horticulturist and Head Gardener for 1933. *Brooklyn Bot. Gard. Record* 23: 87-94. April.

The planting and cultivation of annuals. *Brooklyn Bot. Gard. Leaflets XXII*⁶. April 25.

Crocus speciosus. *Gardeners' Chronicle of America* 38: 154. May.

Starting perennials from seed. *Brooklyn Bot. Gard. Leaflets XXII*⁷. May 9.

The rock garden in May. *New York Sun.* May. 12.

Westchester declared rock gardeners' paradise. Flower Show Section of nine *Westchester daily newspapers*. Westchester County Publishers, Inc., Yonkers. June.

The president's address. American Rock Garden Society. *Gardeners' Chronicle of America* 38: 184. June.

The sandworts. *Gardeners' Chronicle of America* 38: 216. July.

Anemones. *Gardeners' Chronicle of America* 38: 218. July.

What garden clubs can do to educate the public. *Garden Club Exchange*. Meredith Publishing Co., Des Moines, Iowa. August.

Rock and wall gardens. *Booklet* published by McCall's Magazine. August.

Small rock gardens gain in beauty. *New York Times*. August 5.

Wild tulips for your garden. *New York Sun*. August 11.

"Lesser" bulbs for variety. *New York Sun*. September 1.

Wild tulips for your garden. *Garden Digest* 6: 8-10. October. Repr. *New York Sun*, Aug. 11.

The care of house plants. *Brooklyn Bot. Garden Leaflets* XXII⁸⁻⁹. October 24.

Repotting and dividing house plants. *Gardeners' Chronicle of America* 38: 356. December. Repr. *Brooklyn Bot. Gard. Leaflets* XXII⁸⁻⁹. Oct. 24.

Gager, C. Stuart

Annual report of the Brooklyn Botanic Garden: Report of the Director. *Brooklyn Bot. Gard. Record* 23: 13-170. April.

Adaptations in the plant world. *The Great Design*. Chapter 7, pages 161-185. London. Duckworth. May.

Graves, Arthur Harmount

Forest pathology. (Annual Report.) Chestnut breeding work in 1933. *Brooklyn Bot. Gard. Record* 23: 67-75. April.

Report of the Curator of Public Instruction for 1933. *Brooklyn Bot. Gard. Record* 23: 94-102. April.

Report on winter injury to the woody plants in the Brooklyn Botanic Garden. *Brooklyn Bot. Gard. Record* 23: 171-209. July.

Autumn coloration. *Brooklyn Bot. Gard. Leaflets* 22⁸⁻⁹. October.

50 newspaper articles relating to the Brooklyn Botanic Garden.
16 abstracts in *Biological Abstracts*.

Graves, Arthur Harmount and Alfred Gundersen

The collection of living cycads at the Brooklyn Botanic Garden.
Brooklyn Bot. Gard. Leaflets 22¹⁻². February.

Gundersen, Alfred

Report of the Curator of Plants for 1933. *Brooklyn Bot. Gard. Record* 23: 75-80. April.

Gundersen, Alfred and Arthur Harmount Graves

The Collection of Living Cycads at the Brooklyn Botanic Garden. *Brooklyn Bot. Gard. Leaflets* 22¹⁻². February.

Reed, George M.

Plant Pathology. *Brooklyn Bot. Gard. Record* 23: 54-63. April.

Inheritance of resistance to loose and covered smut in hybrids of Black Mesdag with Hull-less, Silvermine, and Early Champion oats. *Amer. Jour. Bot.* 21: 278-291. May.

The iris of Japan. *Flower Grower* 21: 290, 291. July.

Inheritance of resistance to loose smut and covered smut in some oat hybrids. *Jour. Agr. Res.* 48: 1073-1083. June.

(Cooperative investigations with the Division of Cereal Crops & Diseases, U. S. D. A. T. R. Stanton, George M. Reed, and F. A. Coffman).

Shaw, Ellen Eddy

The joys of a seed catalogue. *McCall's Magazine*. February.

The museum, an integral part of the science program. *Journal of the American Nature Study Society* 1: 4. April.

Report of the Curator of Elementary Instruction. *Brooklyn Bot. Gard. Record* 23: 103-110.

Garden land. *News Notes of the National Council of Supervisors of Elementary Science* 1: 5. May.

Vacation fun for boys and girls. *The Sun*. July 3.

Plants for classrooms. *Bulletin No. 2 of The School Nature League*. October.

The following 39 articles appeared in *The Sun* (New York) on the dates indicated:

The seed catalogue. February 3.

Novelties among the annuals. February 10.

- Novelties among the perennials. February 17.
 Starting perennial seed. February 24.
 The lawn. March 3.
 The lawn. March 10.
 Roses for the small garden. March 17.
 Starting annuals indoors. March 24.
 Novelties among the roses for 1934. March 31.
 The foolproof vegetable garden. April 7.
 Annuals for the small garden. April 14.
 The good old dahlia. April 21.
 The interesting and unusual among the flowers. April 28.
 What to plant in early May. May 5.
 Color in the garden. May 12.
 Late planting and more of it. May 19.
 What to do with the house plants. May 26.
 Distinction among the shrubs. June 2.
 Distinction among the trees. June 9.
 Distinction among the vines. June 16.
 A look-see in the garden. June 23.
 Our climbing roses—their future treatment. June 30.
 Trouble in the garden. July 7.
 Check-up on progress in the garden. July 14.
 Are my plants doing well? If not, why not? July 21.
 Order your evergreens now. July 28.
 Perennials for next year. August 4.
 The lawn again. August 11.
 Bulbs to order for spring beauty. August 18.
 The glass indoor garden: what to bring back for it. August 25.
 Preparing for winter bloom. September 1.
 The outdoor bulb bed. September 8.
 Our friends, the trees. September 15.
 The planting of shrubs for spring bloom. September 22.
 Buying bulbs for indoor culture. September 29.
 Fall planting of roses and perennials. October 6.
 Hints and helps on fall propagation of plants. October 13.
 Protection of plants against winter storms. October 20.
 How to prevent trouble for the house plants. October 27.

Svenson, Henry K.

List of Seeds Offered in Exchange. *Brooklyn Bot. Gard. Record* 23: 1-11. January.

Report of the Associate Curator of Plants for 1933. *Brooklyn Bot. Gard. Record* 23: 80-86. April.

Monographic Studies in Eleocharis—III. *Rhodora* 36: 377-389, 2 pl. 1934. *Brooklyn Bot. Gard. Contributions*, No. 68. November.

APPENDIX 3

TALKS, LECTURES, ADDRESSES, AND PAPERS
GIVEN BY THE BOTANIC GARDEN
PERSONNEL DURING 1934

By the Director:

June 7. *The activities of the Brooklyn Botanic Garden.* Conference of Regents of Greater New York and Long Island Chapters, N. S. D. A. R. At the Garden.

October 9. *Brooklyn Botanic Garden and the Radio Garden Club of New Jersey.* Radio Garden Club Meeting. New Brunswick, N. J.

By the Curator of Public Instruction:

March 2. *Making a new chestnut tree.* Biology Club, Abraham Lincoln High School.

July 31. *The work of the Brooklyn Botanic Garden.* Omnibus College. At the Garden.

August 1. *The work of the Brooklyn Botanic Garden.* Class in education from N. Y. University. At the Garden.

August 15. *Hybridizing the American chestnut.* Girl Scouts of Wallingford. At the trial grounds. Hamden, Conn.

August 22. *The use of wood as fuel, and the relative fuel value of various native tree species.* Girl Scouts of Wallingford. (Girl Scout Camp. Wallingford, Conn.)

September 20. *Trees and shrubs.* Millbrook Garden Club. Red Hook, N. Y.

By the Curator of Elementary Instruction:

January 25. *Graduation address.* P. S. 119.

January 27. *Nature study for boys and girls.* Pupils of private schools, and parents. At the Garden.

- January 31. *Children's work at the Brooklyn Botanic Garden.*
Midwinter Institute, St. Marks Methodist Episcopal
Church, Brooklyn.
- February 15. *Nature study - living not dead.* Union County
(N. J.) Chapter, American Nature Study Society, Roselle
Park, N. J.
- February 21. *Children and nature study.* Mothers' Club, P.
S. 117, Queens.
- March 7. *Gardens for boys and girls.* P. S. 189.
- March 12. *What the Brooklyn Botanic Garden offers to elemen-
tary schools.* Principals of School Districts 26 and 28,
Brooklyn, Board of Education Building.
- March 13. *Planning and maintenance of the small grounds.*
Bellerose Woman's Club, Bellerose, Long Island.
- March 16. *Prepare for your garden.* Garden Group of Inter-
national Vital Interests, Inc., New York, N. Y.
- March 21. *Children's garden work at the Brooklyn Botanic
Garden.* School Garden Association, American Museum
of Natural History, New York, N. Y.
- March 29. *Gardens for boys and girls.* P. S. 135.
- April 4. *Educational work of the Brooklyn Botanic Garden.*
Women of the School of Education, New York University.
At the Washington Square College.
- April 12. *Activities of the Brooklyn Botanic Garden.* Men's
Club, Tompkins Avenue Congregational Church,
Brooklyn.
- April 14. *Nature study not in books.* Westchester County
Teachers Association, White Plains, New York.
- April 18. *Gardens for boys and girls.* P. S. 155, Queens.
- April 19. *The Brooklyn Botanic Garden and its activities.*
Mother's Club, P. S. 9. At the Garden.
- April 20. *The children's activities at the Brooklyn Botanic
Garden.* Fortnightly Library Club. At the Garden.
- April 27. *Arbor Day.* Newtown High School.
- May 14. *Children's activities at the Brooklyn Botanic Garden.*
Mothers' Club, P. S. 117, Queens. At the Garden.
- May 16. *Address of welcome to the Brooklyn Botanic Garden.*
Heads of Department Association. At the Garden.

- May 21. *Children's work at the Brooklyn Botanic Garden.* Brooklyn Plant, Flower and Fruit Guild, Brooklyn.
- May 22. *Address of welcome.* Brooklyn Section, New York Public School Kindergarten Association. At the Garden.
- May 23. *The educational value of children's gardening.* Staten Island Garden Club, Dongan Hills, Staten Island.
- May 24. *Activities of the Brooklyn Botanic Garden.* Mothers' Club, P. S. 225. At the Garden.
- June 20. *Educational work of the Brooklyn Botanic Garden.* Faculty of P. S. 186. At the Garden.
- June 21. *Class Day address.* P. S. 13.
- June 22. *Graduation address.* P. S. 9.
- June 26. *Graduation address.* P. S. 169.
- September 20. *Gardens for all.* Lily of the Valley Guild, Gerritsen Beach, Brooklyn.
- September 20. *Bulb culture.* South Side Garden Club, Islip, Long Island.
- September 21. *Garden exhibits.* Woman's Club of Queens Village, Long Island.
- October 5. *Gardens for boys and girls.* Cedarhurst School No. 5, Cedarhurst, Long Island.
- October 16. *Children's work at the Brooklyn Botanic Garden.* Dorcas Society, Immanuel Methodist Episcopal Church, Brooklyn.
- October 16. *Little gardens for kindergarten rooms.* Brooklyn Section, New York Public School Kindergarten Association. At the Garden.
- October 22. *What Federated Garden Clubs may do in the field of work for boys and girls.* Presidents' Council, Federated Garden Clubs of New York State. At Hotel Roosevelt, New York, N. Y.
- October 26. *How Nature Curators can start garden clubs.* School Garden Association of New York, Hall of the Board of Education, New York, N. Y.
- October 31. *Plants for the classroom.* American Museum of Natural History, New York, N. Y.
- November 1. *Planning a garden for the small grounds.* Lily of the Valley Guild, Gerritsen Beach, Brooklyn.

- November 21. *House plants*. Lily of the Valley Guild. At the Garden.
- November 23. *Garden work for boys and girls*. Woodmere Academy. Woodmere, Long Island.
- December 12. *Soils*. Department of Botany, Brooklyn Institute of Arts and Sciences. At the Garden.
- December 20. *Christmas fables and Christmas customs*. Two assemblies, P. S. 233.

By the Curator of Plant Pathology:

- February 26. *Iris of Japan*. Monday Afternoon Club of Plainfield, N. J.
- May 5. *Japanese gardens*. Reconciliation Trips. At the Garden.
- May 9. *Gardens in Japan*. Japanese Woman's Club of New York. At the Garden.
- May 10. *Iris*. Germantown Garden Club, Germantown, N. Y.
- May 15. *Gardens in Japan*. Winter's Night Club. At the Garden.
- July 28. *Japanese gardens*. Reconciliation Trips. At the Garden.
- July 31. *Plant breeding*. Class from New York University. At the Garden.
- October 19. *Japanese gardens*. Reconciliation Trips. At the Garden.
- October 27. *Japanese gardens*. Reconciliation Trips. At the Garden.
- November 17. *Japanese gardens*. Reconciliation Trips. At the Garden.
- December 13. *Insect pests and plant diseases*. Matinecock Garden Club, Glen Cove, L. I.

By the Curator of Plants:

- April 27. *Ornamental Shrubs*. Abraham Lincoln High School, Biology Department.

By the Associate Curator of Plants:

- February 15. Ferns and flowering plants of the New York region. Brooklyn Nature Club. At the Children's Museum.

February 20. Native berries. Queens County Bird Club.
Flushing, L. I.

November 14. Native plant gardens. Brooklyn Institute,
Dept. of Botany. At the Garden.

By the Horticulturist:

January 8. *Plant propagation*. East Orange Garden Club.

January 17. *House plants*. Horticultural Society of New
York.

January 24. *Making a well-balanced schedule*. Course in
flower show judging, Federated Garden Clubs of New
Jersey. Orange, N. J.

April 2. *English gardens*. Sun Dial Garden Club, Hillside,
N. J.

April 5. *Rock gardens and rock garden plants*. Garden Insti-
tute in connection with Co-operative Extension Work in
Agriculture and Home Economics of the State of New
Jersey. Hackensack.

April 14. *Fern growing in the home*. American Fern Society.
At the Garden.

May 22. *Styles in rock gardens*. Rock Garden Day. At the
Garden.

June 12. *The roses and the winter*. Rose Garden Day. At
the Garden.

June 26. *Plant propagation*. Garden Club of Easthampton,
L. I.

September 25. *Trees and shrubs*. Ridgefield (Conn.) Garden
Club.

September 27. *House plants*. Litchfield (Conn.) Garden
Club.

October 4. *Pruning*. Englewood (N. J.) Garden Club.

October 22. *Shrubs*. Round table discussion. Federated
Garden Clubs of New York State. Hotel Roosevelt, New
York City.

October 23. *Bulbs*. Long Island Horticultural Society, at
Farmingdale.

December 11. *House plants*. Gardening course. New York
Herald-Tribune.

By Instructors:*Miss Dorward:*

April 9. *The Brooklyn Botanic Garden.* Mothers' Club, Bedford Academy. At the Garden.

Miss Jenkins:

February 8. *Annuals.* Garden Department of the Woman's Club, Tenafly, N. J.

February 9. *Planning and budgeting the small garden.* Garden Department of the Catholic Women's Club of Westchester County, New Rochelle, N. Y.

February 15. *Starting the small garden.* Mothers' Club, P. S. 100, Queens.

March 9. *Annuals in the garden.* Garden Department of the Woman's Club of Scarsdale.

March 16. *Annuals in the garden.* Garden Club, Essex Fells, N. J.

March 21. *Annuals in the garden.* Spade and Trowel Club, Plainfield, N. J.

April 14. *Planning and budgeting the small garden.* Philipps Manor Garden Club, Tarrytown, N. Y.

April 11. *Little gardens for little children.* Mothers' Club, P. S. 134.

April 20. *Flower arrangement.* Garden Club of Elizabeth, N. J.

April 24. *Flower arrangement.* Western Electric Company, Kearny, N. J.

April 27. *The perennial border.* Garden Department, Woman's Club of Queens Village.

Miss Miner:

February 16. *Children's gardens.* Garden Club of Cornwall, N. Y.

By the Resident Investigator (Economic Plants):

April 14. *Beverages: Plant sources and uses.* (Public Saturday Lecture Series) New York Botanical Garden.

By the Resident Investigator (Ferns):

December 5. *Ferns.* Biology Club of Brooklyn College.

By the Custodian:

- June 7. *Plant Conservation*. Brooklyn Boy Scout Nature Club. Children's Museum, Brooklyn.

APPENDIX 4

**RADIO TALKS BY THE BOTANIC GARDEN
PERSONNEL DURING 1934**

By the Horticulturist:*From Station WOR**

- January 12. Garden books.
February 9. Garden books.
April 16. American Rock Garden Society. Under auspices of Federated Garden Clubs of New Jersey.
April 23. Garnering plants for the rockery.
May 25. Random garden thoughts.
June 7. Roses and their history.
July 27. The story of the dahlia.
August 27. The gardener takes a vacation.
September 10. The story of the chrysanthemum.
October 29. The story of the tulip.
November 26. Berries and shrubs as decorative material.
December 24. Christmas plant folk lore.

From Station WNYC

- February 22. Preparing for the spring garden.
April 19. April in your garden.
May 17. May in your garden.
July 26. Seeds.
December 13. Christmas plant folk lore.

By the Curator of Public Instruction:*From Station WNYC:*

- January 4. Research at the Brooklyn Botanic Garden and the Dutch Elm Disease.
January 25. Interesting plants at the Brooklyn Botanic Garden.

* Radio Garden Club addresses given in co-operation with the Co-operative Extension Work in Agriculture and Home Economics of the New Jersey College of Agriculture.

- February 1. The cycads at the Brooklyn Botanic Garden.
- February 15. Plants in the conservatories of the Brooklyn Botanic Garden.
- March 1. Plants in the conservatories of the Brooklyn Botanic Garden.
- March 15. The Brooklyn Botanic Garden exhibit at The International Flower Show.
- March 29. Signs of spring.
- April 12. Spring flowers at the Brooklyn Botanic Garden.
- April 26. What to see at the Brooklyn Botanic Garden.
- May 10. What to see at the Brooklyn Botanic Garden.
- May 24. The Japanese Garden at the Brooklyn Botanic Garden.
- June 7. The Rose Garden of the Brooklyn Botanic Garden.
- October 4. The educational program at the Brooklyn Botanic Garden.
- November 15. What to see at the Brooklyn Botanic Garden.

By the Curator of Elementary Instruction:

From Station WNYC:

- January 11. What to do with your Christmas plants.
- January 18. Hints and helps to gardeners.
- February 8. Starting perennial seed for the outdoor garden.
- March 8. Starting seeds of annuals for the outdoor garden.
- April 5. New annuals for your garden.
- May 3. Planning the flower garden.
- May 31. Bedding plants.
- September 27. The bulb garden.
- November 1. Indoor culture of bulbs.
- December 27. Care of Christmas plants.

From Station WOR:

- In cooperation with New Jersey College of Agriculture.
- January 26. Gardening for your boy and girl.
- April 6. Gardens for young folks.
- In cooperation with Federated Garden Clubs of New Jersey.
- December 3. The care of house plants.

By Instructors (Miss Jenkins).*From Station WNYC:*

March 22. The small vegetable garden.

August 30. Late summer in your garden.

APPENDIX 5**FIELD TRIPS CONDUCTED****By the Curator of Plants:**

May 12. Brooklyn Institute, Department of Botany. Trip to Hollis, L. I.

July 14-15. Torrey Botanical Club. Trip to the top of Slide Mt. in the Catskills.

October 7. Torrey Botanical Club. To Dunderberg Mountain.

By the Associate Curator of Plants:

March 25. Torrey Botanical Club. To Arden, N. J., to study trees.

April 21. Torrey Botanical Club and Timeology Fellowship Group. At the Garden.

By the Custodian:

June 9-10. Brooklyn Nature Club. Herons Nest, Delaware Valley, Sussex County, New Jersey.

By the Horticulturist:

March 1. Columbia University Horticultural Class in the Brooklyn Botanic Garden.

APPENDIX 6**MEETINGS OF ORGANIZATIONS AT THE
GARDEN 1934**

February 7. Woman's Auxiliary, Brooklyn Botanic Garden. Luncheon.

March 26. Monday Culture Charity Club.

April 9. Parent Teachers' Association, Bedford Academy.

14. American Fern Society.
 16. Department of Biology, Drew University.
 19. Mothers' Club, P. S. 9.
 20. Fortnightly Library Club of Brooklyn.
 21. Torrey Botanical Club.
 21. Timeology Fellowship.
 23. Woman's Auxiliary, Brooklyn Botanic Garden.
- May
1. Cedarhurst-Lawrence Garden Club.
 1. Cresco Garden Club.
 2. Women of '76, N. S. D. A. R.
 3. American Association of University Women (New York Chapter).
 9. Japanese Woman's Club of New York.
 10. Contemporary Club.
 10. Chiropean Club.
 14. Mothers' Club, P. S. 117.
 14. Ladies Auxiliary, Holy Family Hospital.
 15. The Junior League of Brooklyn.
 15. Winters Night Club.
 16. Heads of Department Association.
 16. Torrey Botanical Club.
 17. Far Rockaway Garden Club.
 17. Woman's Guild, Church of the Evangel.
 22. American Rock Garden Society.
 22. Brooklyn Kindergarten Teachers Association.
 22. Bergenfield Woman's Club, International Relations Garden and Liberal Arts Department.
 23. Ridgewood (N. J.) Garden Club.
 23. Far Rockaway Women's Club, Garden Department.
 24. Mothers' Club, P. S. 225.
 24. Brooklyn Nature Club.
- June
7. N. S. D. A. R., Regents of New York City and Long Island.
 12. Ellen Hardin Walworth Chapter, N. S. D. A. R.
 13. Merrick Garden Club.
 13. Milburn (N. J.) Garden Club.
 18. Little Neck Garden Club.
 20. P. S. 186. June Conference.

21. Prophylae of Brooklyn College.
 25. St. John's University School of Pharmacy.
 September 20. Executive Committee, Department of Botany,
 Brooklyn Institute of Arts and Sciences.
 October 9. Woman's League, All Souls Church.
 16. Brooklyn Section, New York Public School Kinder-
 garten Association of New York City.
 18. Department of Botany, Brooklyn Institute of Arts
 and Sciences.
 30. Ridgewood (N. J.) Garden Club.
 November 7. Woman's Auxiliary, Brooklyn Botanic Garden.
 14. Department of Botany, Brooklyn Institute of
 Arts and Sciences.
 December 12. Department of Botany, Brooklyn Institute of
 Arts and Sciences.

	1931	1932	1933	1934
Number of organizations.....	23	59	49	48
Total attendance.....	1146	2741	3357	1906

APPENDIX 7

REPORT ON PHOTOGRAPHIC WORK

Negatives on file December 31, 1933.....	8,544
Negatives accessioned during 1934.....	<u>159</u>
Total negatives on file December 31, 1934.....	8,703
Lantern slides on file December 31, 1933.....	6,090
Lantern slides accessioned during 1934.....	<u>95</u>
Total lantern slides on file December 31, 1934.....	6,185
Prints on file December 31, 1933.....	4,920
Prints made during 1934.....	1,909
Used or distributed.....	<u>750</u>
Prints filed during 1934.....	<u>1,159</u>
Total prints on file December 31, 1934.....	6,079
Enlargements made.....	24

Respectfully submitted,
 FRANK STOLL,
Registrar.

APPENDIX 8

REPORT ON BROOKLYN BOTANIC GARDEN
PUBLICATIONS, 1934*American Journal of Botany*

Official Organ of the Botanical Society of America

Volume XXI (1934) comprised, as usual, ten monthly issues (omitting August and September), with 58 papers, 728 pages, 20 plates, and 341 text figures (as against 53 papers, 696 pages, 48 plates and 280 text figures in 1933). Dr. Arthur Harmount Graves continued on the editorial board as representative of the Brooklyn Botanic Garden. Professor Sam F. Trelease, of Columbia University, continued as Editor-in-Chief.

The circulation at the close of the fiscal year (November 30, 1934) was 1,569 as against 1,582 one year ago. The annual budget was \$13,194.69 as against \$12,294.38 in 1933. The year closed with a credit balance of \$3,796.72 and assets over liabilities of \$4,129.02 plus the value of back sets and volumes on hand.

Ecology

Official Organ of the Ecological Society of America

Quarterly. Volume XV comprised 36 papers (besides reviews, proceedings, and miscellaneous matter), 456 pages and 96 text figures (as against 28 papers, 420 pages and 138 text figures in 1933). The circulation at the close of the fiscal year (November 30, 1934) was 987 as against 943 one year ago.

The annual budget was \$5,021.12, the credit balance \$1,688.90 and assets over liabilities \$1,727.97 (as against \$5,046.50, \$899.70 and \$985.18 assets over liabilities in 1933) plus the value of back sets and volumes on hand. Dr. Henry K. Svenson continued on the editorial board as the Brooklyn Botanic Garden representative. Prof. Alfred E. Emerson and Prof. George D. Fuller, both of the University of Chicago, continued as Editor and Associate Editor, respectively.

Genetics

In Co-operation with the Editorial Board of Genetics

Bimonthly. Volume XIX comprised 35 papers, 634 pages, 9 plates, and 75 text figures (as against 31 papers, 555 pages, 6

plates, and 91 text figures in 1933). At the close of the fiscal year (November 30, 1934) the circulation was 652, the annual budget \$9,260.49, the credit balance \$3,774.18, and assets over liabilities \$4,487.16 (as against 610, \$5,966.98, and \$1,531.01 in 1933), plus the value of back sets and volumes on hand. Dr. Donald F. Jones, Connecticut Agricultural Experiment Station, continued as Managing Editor.

Brooklyn Botanic Garden Record

Quarterly. Volume XXIII comprised 246 pages. The April number comprised the Annual Report. The circulation of the Record at the close of the year was 1,564.

Leaflets

Three single numbers and three double numbers were issued. The circulation as of December was 1,741.

Contributions and Memoirs

Numbers 66, 67, and 68 of the Contributions were published. No Memoir was published.

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 Traendly, Mrs. Frank H.
 Tredick, Miss Helen F.

Turner, Mrs. Henry C.
 Tusch, Mrs. Walter
 Tuttle, Mrs. Winthrop M.
 Tyler, Mrs. Walter L.
 Udkowsky, Bernard
 Vail, Harry C.
 Valentine, Stephen
 Van Brunt, Jeremiah R.
 Van Sinderen, Adrian
 Van Sinderen, Mrs. Adrian
 Van Sinderen, Henry B.
 Van Vleck, Miss Clara
 Vernon, Paul E.
 Von Lehn, Mrs. Richard
 Vovodich, Miss Catherine
 Walcott, Mrs. Arthur S.
 Waldes, Mrs. Ica
 Walker, Mrs. Arthur II.
 Walton, Mrs. Henry A.
 Wandel, Mrs. William S.
 Ward, Mrs. Charles L.
 Wark, Charles F.
 Warren, Mrs. Luther F.
 Warren, William H.
 Watton, Mrs. W. F.
 Wayman, Robert
 Weber, Henry
 Weber, Louis

Weck, Mrs. Edward
 Weeth, Dr. Charles R.
 Weinberg, Harry
 Weithas, Mrs. R. C.
 Wells, Mrs. Walter F.
 Wenzel, Fred.
 White, Alain
 White, Mrs. Alexander M.
 Wikander, Miss Elin
 Wikle, Mrs. Herbert T.
 Willard, George N.
 Willetts, Mrs. W. P.
 Williams, Mrs. E. F.
 Williams, Mrs. John O.
 *Williams, R. L.
 Williamson, Miss Marguerite Moli-
 ère
 Wilson, Mrs. Christopher W.
 Wilson, Mrs. Francis A.
 Wing, Miss Beulah A.
 Wood, Mrs. Guy C.
 Wood, Mrs. Willis D.
 Woodruff, Miss Helen G.
 Woodward, Miss Mary Blackburne
 Young, J. Marshall
 Zabriskie, Mrs. Elmer T.
 Zellner, Mrs. Carl P.
 Zimmele, Charles F.

SUMMARY OF MEMBERSHIP

Benefactors	6	
Patrons	14	
Donors	26	
Permanent Members	72	
Life Members		
Through the Botanic Garden	21	
Through Other Departments	219	240
Sustaining Members		
Through the Botanic Garden	13	
Through Other Departments	38	51
Annual Members		612
Total, as of March 15, 1935		1,021

BROOKLYN BOTANIC GARDEN RECORD

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NO. 3

BOOKS AND MANUSCRIPTS ILLUSTRATING THE HISTORY OF BOTANY* AN ANNOTATED LIST

" . . . the images of men's knowledge remain in books, exempt from the injuries of time, and capable of perpetual renovation."

Bacon: Advancement of Learning.

In the year 1918 two friends of the Brooklyn Botanic Garden made a contribution of \$10,000 to the Endowment Fund as a memorial, specifying that the income should be used for the scientific and educational work of the Garden. At that time only \$500 of the endowment had been designated for the Library.

It was Mr. Alfred T. White, then Chairman of the Botanic Garden Governing Committee, who suggested that we might like to set this sum aside to provide rare or important publications which we might otherwise feel that we could not afford. This suggestion was eagerly welcomed, as the need of income for this purpose had been keenly felt. By wise investment the principal of this fund now amounts to \$13,417.20.

The items in this exhibit are only a few of the more important books with which the income from this fund has enriched our library. A very few of the items were received as gifts.

* Exhibited by the Library of the Brooklyn Botanic Garden on the occasion of its Twenty-fifth Anniversary Celebration, May 13-16, 1935. Catalog prepared by Emilie Perpall Chichester and C. Stuart Gager.

It has been gratifying to find that these volumes have not merely served sentimental or collector's interest, but are among the books most actively consulted for their contents. They are, of course, the foundational works of botanical and horticultural literature, and must be accessible to anyone whose reading or researches lead to the early history of plant study, including subject matter, the development of scientific method, the history of plant nomenclature, the evolution of our modern botanical conceptions and principles, botanical biography, and iconography. In fact, some acquaintance with these books and their authors is absolutely essential for a first hand knowledge of the history of botany, and to enable one to consider the present status of botanical science in scholarly perspective.

No gift to the Brooklyn Botanic Garden has ever met a more essential requirement. A larger endowment for the library is one of our present urgent needs.—C. S. G.

INCUNABULA

(15th Century Books)

1. BARTHOLOMAEUS ANGLICUS.

De Proprietibus rerum. Argentine, [Georg Husner] 1491.

The earliest edition of this work, appearing about 1470, was the first printed book of plant interest. It was a standard work on natural history throughout the Middle Ages, including the entire field of scientific knowledge in that period.

2. COLUMELLA, [L.] J. M.

[*Hortuli commentarium*] [Rome, Bart. Guldinbeck, 1485]

The very rare first separate edition of Columella's work, which consists of comments on the historical and legendary properties of various plants.

3. [CRESCENZI, PTERO DE]

[*Opus ruralium commodorum*] [Spier, P. Drach, c1495]

Generally considered to be the most important treatise on agriculture and gardening produced in the Middle Ages.

4. HERBARIUS LATINUS.

[Without name of place or printer, no date] [Johann Petri, Passau, c1486]

"Based largely upon pre-existing manuscripts, representing a tradition of great antiquity, the Latin Herbarius was an anonymous compilation from medieval writers and from some classical & Arabian authors."

5. HERBARIUS LATINUS.

Arnoldus de Nova Villa. Incipit tractatus de virtutibus herbarum. Venice, 1491.

The first edition printed in Italy, but the second appearance of the cuts. All the plants described were from the Venetian region and the object of the work was to help the reader to cheap and easy remedies.

6. HERBARIUS LATINUS.

[*Arnoldus de Nova Villa*] *Tractatus de virtutibus herbarum.* Venice, Bevilacqua, 1499. (2 copies are shown.)

Second edition of the Herbarius printed in Italy, reprinted from the 1491 edition of Achates. The wood-cuts are from the same blocks, and are uncolored. This is sometimes ascribed to Arnoldus, from the occurrence of his name at the beginning of the work.

7. [HORTUS SANITATIS]

Herbarius zu Teutsch und von aller Handt Kreuteren. Augsburg, Johann Schonsperger, 1488.

The German Herbarius was the foundation of the Hortus Sanitatis. According to Dr. J. F. Payne the work "forms an important landmark in the history of botanical illustration . . ."

EARLY HERBALS AND OTHER PRE-LINNEAN WORKS

8. ALDROVANDI, ULISSE.

Dendrologiae naturalis scilicet arborum historiae libri duo sylvae Glandaria . . . 1668 (Colophon, 1667).

First edition.

Aldrovandi established the botanic garden in Bologna in 1567.

9. BACON, FRANCIS.

Sylva sylvarum: or A naturall historie in ten centuries. 1627.
(Includes: *New Atlantis*). First edition. To the first of these works Bacon himself referred as "An undigested heap of particulars" suggesting problems for investigation. The second, a work of imagination, the author had represented as having already achieved some of the benefits he wished for mankind.

10. BAUHIN, CASPAR.

Pinax theatri botanici . . . 1671.

Includes his *Prodromos theatri botanici* . . . 1671.

"The fact of natural affinity had been recognized in the *Pinax* of Caspar Bauhin as the foundation of a natural system . . . The distinction between species and genus is fully carried out; every plant has with him a generic and a specific name, and this binary nomenclature . . . is almost perfectly maintained by Bauhin, especially in the *Pinax*," though a third and fourth word is often added to the specific name. He described about 6,000 species (vs. 600 by Dioscorides).

11. BELON [DU MANS] P[IERRE]

De arboribus, coniferis, resiniferis, aliis quoque nonnullis sempiterna fronde viventibus, cum earundem iconibus ad vivum expressis . . . 1553.

First edition.

The earliest work on conifers.

In his book, *Le Remonstrance* etc., Paris, 1558, Belon introduced, and for the first time systematically employed, binomial nomenclature for plants, 180 years before Linné.

12. BOCK, HIERONYMUS.

Kreuter Buch darinn underscheidt, Namen unnd W'irckung der Kreutter, Stauden, Hecken unnd Beumen . . . 1551.

Jerome Bock (Tragus) was a contemporary of Brunfels. "Ecology forms an item and a very distinct one in the account of almost every wild plant which he describes." He is credited with being the first to describe the stamen as made up of two distinct parts, and the first of the early German botanists to actually describe plants instead of merely repeating the descriptions of classic authors.

13. [BOYLE, ROBERT] 1627-1691.

Some considerations touching the usefulness of experimental naturall philosophy . . . 1663.

First edition.

The First Part, written when Boyle "was scarce above 21 or 22 years old," contains paragraphs on Peruvian bark and other American drugs.

14. BRUNFELS, OTTO.

Contrafayt Kreuterbuch nach recter vollkommener Art und Beschreibungen der Alten besstberumpten Artzt. 1532.

First German edition.

"In this whole work I have no other end in view than that of giving a prop to fallen botany; to bring back to life a science almost extinct. And because this has seemed to me to be in no other way possible than by thrusting aside all the old herbals, and publishing new and really lifelike engravings, and along with them accurate descriptions extracted from ancient and trustworthy authors, I have attempted both; using the greatest care and pains that both should be faithfully done."

15. CAMERARIUS, JOACHIM.

Hortus medicus et philosophicus . . . 1588.

First edition.

(Includes: THAL, J. *Sylva Hercynia . . .* and CAMERARIUS, J. *Icones accurate . . .*)

This, the author's chief work, is illustrated in part by Gesner's drawings. These represent a considerable advance, botanically, as they show details of floral structure on an enlarged scale. (See also No. 36.)

16. CLUSIUS, CAROLUS.

Rariorum aliquot stirpium per Hispanias observatarum historia . . . 1576.

First edition.

The first original work of L'Ecluse was this account of plants observed on an expedition to Spain and Portugal. This work, says Burgess, "ushered in a new era in the definite limitation of species in Aster." It also describes some American plants.

17. COLE, WILLIAM.

Adam in Eden. 1657.

First edition.

A rare herbal, in which the Doctrine of Signatures is carried to an extreme length. The author was a keen and enthusiastic collector of herbs.

18. COLONNA, FABIO.

[*Phytobasanos*] *sive plantarum aliquot historia.* 1592.

First edition.

The great feature of the book is the excellence of its descriptions and figures. The latter are noted as the first etchings on copper illustrating a botanical work.

19. COLUMELLA, [L. J. M.]

De re rustica libri xii . . . 1541.

Born in the first century, at Cadiz, this celebrated Latin writer had a good practical knowledge of agriculture. His whole work is a treasury of information about ancient husbandry and the treatment of cultivated plants and trees.

20. CULPEPER, NICH[OLAS]

Pharmacopoeia Londinensis: or the London dispensatory . . . 6th edition. 1659.

An exponent of astrological botany, Nicholas Culpeper became most unpopular with English physicians by publishing an unauthorized edition of the Pharmacopoeia, issuing it under ~~various~~ titles.

21. CUSA, NICOLAUS DE. 1401-1464.

Opera. Paris, 1514.

In this book (Vol. I, folio XCVI) Cusanus (Niklas Krebs or Chryppfs) describes one of the first biological experiments of modern times. He weighed seeds and planted them in 100 pounds of soil. Afterwards he weighed the soil and the plants that grew from the seed. Since the soil lost little in weight he concluded that the plants acquired most of their weight from the water which had been added to the soil; 137 years later van Helmont (q.v., No. 41) described a similar experiment, "pirated," says Singer, from Cusanus. It was 213 years after Cusa before Hales, in his

Vegetable Staticks (1727), described his own quantitative experiments with plants.

22. DIOSCORIDES, PEDAQUIOS ANAZARBEUS.

[*De materia medica libri sex. De venenatis animalibus libri duo*] Venice, 1518.

Second edition in Greek, printed in the famous Greek type of the Aldine press.

This work was the foundation of medical practice for over fifteen centuries. It lists and describes about six hundred plants, giving their medicinal properties. For a hundred years after the first Latin edition appeared, the most important herbals were in the nature of commentaries on Dioscorides.

23. DODONAEUS, REMBERT.

Cruydeboeck in den welcken die gheheele historie, dat es tygheslacht . . . 1554.

First edition.

Dodonaeus's most important book, which was translated and reissued many times. Meyer says: "This fortunately very unessential edition is one of the greatest rarities of botanical literature."

24. DODONAEUS, REMBERT.

A Niewe herball, or historie of plantes: wherein is containd . . . all sortes of herbes and plantes . . . 1578.

First edition in English. Translated by Henry Lyte, and sometimes known as "Lyte's herbal."

The most important herbal in English, until Gerarde's in 1597, which was translated from the Latin edition of this same work.

25. EVELYN, JOHN.

Sylva, or A Discourse of Forest-trees. 1664.

First edition.

A work of the utmost importance, and the first to be printed by order of the Royal Society.

26. FUCHS, LEONHARD.

De historia stirpium commentarii insignes maximis. 1542.

First edition.

The third and youngest of the German "Fathers of Botany." This, his principal work, contains over five hundred magnificent

wood-cuts of native and foreign plants drawn from nature. His chapter on "An Explanation of difficult terms" is said by E. L. Greene to be "the earliest vocabulary of botanical terms that I have met with thus far." The plate shown is one of the earliest published illustrations of Indian corn (*Zea Mays*).

27. FUCHS, LEONHARD.

New Kreuterbuch. 1543.

First German edition.

This contains the same woodcuts as are in the Latin edition. Some of the plates have special interest as being the first European illustrations of American plants.

28. FUCHS, LEONHARD.

Den nieuwen Herbarius, dat is, d'boeck vanden cruyden . . . Gefigureert ende geconterfeyt . . . (1543).

The first and only Flemish edition.

The text in Dutch, translated from the German edition of 1543. The illustrations, although much reduced in size, are extremely fine.

29. FUCHS, LEONHARD

Histoire des plantes de M. Leonhart Fuschius . . . Nouvellement traduit en Francoys. 1549.

First French edition.

30. FUCHS, LEONHARD.

De historia stirpium commentarii insignes. Adiectis earundem vivis, & ad naturae imitationem artificiose expressis imaginibus. 1549.

A later Latin edition, with the small woodcuts.

31. FUCHS, LEONHARD.

De historia stirpium commentarii insignes. Adiectis earundem vivis, & ad naturae imitationem artificiose expressis imaginibus . . . 1551.

Still another Latin edition, attesting the popularity of Fuchs' herbal.

32. GERARDE, JOHN.

Catalogus arborum, fruticum ac plantarum tam indigenarum, quam exoticarum in horto Johannis Gerardi Ciuis & Chirurgi Londinensis nascentium. 1599.

Second edition. (A unique copy, dated 1596, is in the British Museum.)

The first complete catalogue ever published giving the contents of a single garden.

33. GERARDE, JOHN.

The Herball, or generall historie of plantes. Gathered by John Gerarde of London, Master in Chirurgie. 1597.

First edition.

The illustration shown, of the Virginia potato, is probably the first ever published. Gerarde aimed at conveying information in simple, homely language, which would be useful to the common people.

34. GESNER, CONRADUS.

Catalogus plantarum latinè, graecè, germanicè & gallicè . . . 1542.

First edition.

Gesner, born 1516, in Zurich, is commonly considered to be the earliest botanist to recognize the value of the flowers and fruit of plants in determining affinity.

35. GESNER, CONRADUS.

De raris et admirandis herbis, quae . . . lunariae nominantur, commentariolus . . . 1555.

First edition.

A rare little book, the first to give exact descriptions of some Alpine plants.

36. GMELIN, JOHANN GEORG.

Sermo academicus de novorum vegetabilium . . . Adduntur . . . R. J. Camerarii de sexu plantarum epistola. 1749.

First edition.

In the part by Camerarius is the description of the first experimental proof that viable seeds cannot be formed without the co-operation of pollen.

37. GREW, NEHEMIAH.

The anatomy of vegetables begun. 1672.

First edition.

Grew (in England) and Malpighi (in Italy) were the founders of plant anatomy. They were the first to attempt to describe the more obvious anatomical and histological features of the stems, leaves, and fruits of plants.

38. GREW, NEHEMIAH.

Anatomy of plants with .An Idea of a philosophical history of plants. 1682.

First edition of *The anatomy of plants*, and second of *The anatomy of vegetables begun*.

In Chapter V is a clear statement of the author's recognition of sex in plants.

39. GREW, NEHEMIAH.

Comparative anatomy of trunks. 1675.

First edition.

40. HALES, STEPH[EN]

Statical essays . . . an account of some statical experiments on the sap in vegetables. 1738.

This is the third edition of the book first published in 1727, which gave one of the earliest accounts of the nutrition of plants and of the movement of sap.

41. HELMONT, J. B. VAN.

Ortus medicinae, id est, initia physicae inaudita, progressus medicinae novus, in morborum ultionem ad vitam longam. 1651.

First folio edition.

van Helmont, the last of the alchemists, experimented with various gases, and was the first to propose and use the term *gas* (the "spirit of the wood"). On page 66, this word appears for the first time in scientific literature. (Cf. No. 97.)

On page 68 he describes the quantitative experiment in which he planted a willow weighing 5 lbs. in dry soil weighing 200 lbs.

At the end of five years he found the willow weighed a little over 169 lbs. ("169 & circiter uncias tres"). He did not compute the weight of the leaves that fell off, each of the four autumns. The soil and vessel weighed the same as at the beginning, therefore, the wood, bark, and roots had gained 164 lbs. van Helmont concludes from this that carbon is made only of water. It is this experiment that Singer says was "pirated" from Nicholas of Cusa (q.v., No. 21).

In this chapter van Helmont records that this same gas is a product of the fermentation of wine. It is the first description of carbon dioxide.

42. HOOKE, ROBERT.

Micrographia: or Some physiological descriptions of minute bodies made by magnifying glasses . . . 1665.

This famous work is the earliest landmark in the history of microscopy. The illustrations, as accurate as they are beautiful, have been credited to Sir Christopher Wren. Hooke was the first user of the word "cell" to refer to the units of anatomical structure.

43. LEEUWENHOEK, ANTONY VAN.

Ontledingen en ontdekkingen van de cinnaber naturalis, en buspoeder. 1686.

Includes: *U'ervolg der brieven*. 1688; *Send-brieven* . . . 1718.

In addition to a vast amount of work on animalculae and plant histology, van Leeuwenhoek made many discoveries of importance to medicine. He was the first to describe the spermatozoa, to see protozoa, etc.

44. LEEUWENHOEK, ANTONY VAN.

Opera omnia. 1695-1719. 4 vols.

Vol. 1. *Arcana naturae*.

First edition in Latin.

Leeuwenhoek constructed his own microscope and found new marvels in all nature. He gave the first complete account of the red blood corpuscles, found microorganisms in the teeth, and discovered the existence of bacteria.

45. LOBEL, MATTHIA[S]

Plantarum seu stirpium historia . . . cui annexum est adversariorum volumen. 1576.

First edition.

Lobel distinguished different groups of plants by the peculiarities of their leaves, thus forming a scheme of classification, some parts of which, such as Cruciferae and Labiatae, are recognized to this day.

46. MALPIGHI, MARCELLO.

Anatome plantarum. 2 vols. 1675-79.

First edition.

While Hooke was making random sections of both plant and animal tissues and studying their structure, Malpighi and Grew were systematically examining and drawing vegetable tissues under the microscope, and laying the foundations of the science of plant anatomy.

47. MATTIOLI, PIERANDREA.

Di Pedacio Dioscoride Anazarbeo libri cinque della historia & materia medicinale tradotti in lingua volgare italiana. 1544.

First Italian edition of Dioscorides, and first edition of Mattioli's commentary.

A monumental work, the commentary on Dioscorides, issued in more than sixty editions and translated into many languages, was in reality a natural history of all plants known to Mattioli. Dioscorides described about 600 species. Mattioli added between 200 and 300 from Southern Europe.

48. MATTIOLI, PIERANDREA.

Commentarii, in libros sex Pedacii Dioscoridis Anazarbei, de materia medica. Adiectis quam plurimis plantarum & animalium imaginibus, eodem authore. 1554.

First Latin edition.

This was the first edition to be illustrated. It has small, very clear wood-cuts.

49. MATTIOLI, PIERANDREA.

New Kreuterbuch. Mit dem allerschönsten und artlichsten Figuren aller Geweuchse . . . 1563.

The first German edition.

This, the second edition printed at Prague, contains a new set of large wood-cuts, very much more detailed than the earlier ones.

50. MICHELI, PIER ANTONIO.

Nova plantarum genera juxta Tournefortii methodum disposita. 1729.

First edition.

Born at Florence, in 1679, Micheli was the Director of the Botanic Garden there. He was one of the earliest botanists to study mosses and the lower cryptogams, and endeavored to prove the presence of sexual organs in these plants.

51. PARKINSON, JOHN.

Paradisi in sole, paradisus terrestris. 1629.

First edition.

Contains directions for the planting and care of gardens, with descriptions of a large number of plants then in cultivation, with their uses and virtues. Parkinson's scheme of classification is not as good as Lobel's. The title page contains an illustration of the fabled "Scythian Lamb." The first three words of the title are a Latin pun on the author's name.

52. PLINIUS SECUNDUS, CAJUS.

Historia naturale . . . in volgare tradotta per Christophoro Landino. 1534.

A contemporary of Dioscorides, Pliny wrote an encyclopedic account of the knowledge of his own times. He refers to a large number of plants, but only by way of other authors, not because of original observation from nature.

53. [JAMES I. (of England)]

Proclamation concerning starch . . . by the king. Given at Salisbury the 23. day of August, in the fifth ycere of our Reigne. 1607.

"Corn," i.e., wheat, was too much needed for food to be wasted in making starch for ruffs and laces. Hence the laws and prohibitions concerning its making.

54. PORTA, GIOVANNI BATTISTA.

Phytognomonica . . . octo libris contenta. [1588]

First edition.

These illustrations interpret the "Doctrine of signatures," with which Porta was much occupied. The parts of the body cured by certain herbs, or the animal whose bite or sting was cured by it, are shown in the same picture. Porta, says Greene, "was guided by . . . ecology, forms of roots, of leaves, and vegetative organs generally."

55. PORTA, GIOVANNI BATTISTA.

Villae libri xii . . . 1592.

First complete edition.

An interesting, practical treatise on farming, gardening, and agriculture.

56. RAY, JOHN.

Catalogus plantarum circa Cantabrigiam. 1660.

First edition.

John Ray, "the father of English Naturalists," has been described as "the greatest European botanist of the seventeenth century." This, his first book, embodies his work on the flora about Cambridge.

57. RAY, JOHN.

Historia plantarum . . . de plantis in genere . . . 2 vols. 1686.

Vol. 3, Supplement. 1704.

Ray inaugurated a natural system of classification, making use of characters afforded by the fruit and flower as well as other parts of the plant. This work summarizes the chief facts then known about the functions and structure of plants, and describes 18,625 species (vs. 600 by Dioscorides and Bock, 6000 by Bauhin, etc.). Carefully studied by Linnaeus.

"My reasons for attempting this work were . . . To give some light to young students . . . To facilitate the learning of plants . . . without a guide or demonstrator . . . [so] that it shall not be difficult for any man who shall but attend to them and the de-

scription, to find out infallibly any plant that shall be offered to him, especially being assisted by the figure of it."

"I may truly say that if . . . you would, after just examination, weigh my 'History of Plants' in the incorrupt balance of impartial judgment, you would find it rather to need pardon than to merit praise, so many defects and errors there might be discovered therein."

58. RAY, JOHN.

Methodus plantarum nova. 1682.

First edition.

It was in this volume that Ray described the true nature of buds, speaking of them as annual plants springing from old stock. He also recognized, though not naming them, the basic divisions of Monocotyledons and Dicotyledons.

59. RAY, JOHN.

Stirpium Europaeorum extra Britannias nascentium sylloge
. . . 1694.

First edition.

60. RAY, JOHN.

Synopsis methodica stirpium Britannicarum . . . cum indice & virium epitome. 1690.

First edition.

The first systematic British flora. In this work, and in his later *Sylloge* (1694), Ray accepts Grew's teaching that the stamens are male organs.

61. RAY, JOHN.

De variis plantarum methodis dissertatio brevis . . . 1696.

First edition.

62. REDI, FRANCESCO.

Experimenta circa generationem insectorum ad nobilissimum virum, Carolum Dati. 1671.

Second edition and first Latin translation.

By experiment, Redi proved that grubs and maggots do not develop spontaneously in decaying matter; he thus helped to lay the foundations of biogenesis.

63. *REGIMEN SANITATIS Magnini Mediolanensis medici famosissimi attrebatensi episcopo directum. In super opusculum de fleubothomia editu a . . . magistro Reginaldo de villa nova . . .* 1506.

A handbook of household medicine, popular during the Middle Ages, here edited by Arnoldus de Villa Nova.

64. *TABERNAEMONTANUS, JACOB THEODOR.*

Neuw Kreuterbuch . . . 2 pts. in 1 vol. 1588–1591.

First edition.

A large and finely illustrated work, written by a herbalist who had been a pupil of Bock and Brunfels.

65. *THEOPHRASTUS.*

De historia plantarum libri IX . . . 1552.

The pupil and successor to Aristotle, Theophrastus is known as the "Father of Botany." In this book, first printed in 1483, he mentions about four hundred and fifty plants, but his descriptions are vague and the plants extremely difficult to identify.

66. *TOURNEFORT, JOSEPH PITTON DE.*

Institutiones rei herbariae. Editio altera, gallica longe auctior. 3 vols. 1700–[1703].

Tournefort's system of classification was an artificial one, based on the characters of one organ, the corolla.

67. *TRADESCANT, JOHN (JUNIOR)*

Musaeum Tradescantianum, or a collection of rarities preserved at South Lambeth near London. 1656.

Contains also a list of the plants then growing in the famous garden of John Tradescant, senior, gardener to Charles I.

68. *VALLISNIERI [DE VALLISNERA], ANTONIO.*

Dialoghi sopra la curiosa origine di molti insetti. 1700.

Bound with his *Prima raccolta d'osservationi e d'esperienze.* 1710.

He demonstrated that insect larvae in plant "galls" originated from eggs deposited by insects, thus helping to establish the principle of biogenesis.

CARL VON LINNÉ. 1707-1778

FIRST EDITIONS OF HIS WORKS

69. *Amoenitates academicae, seu dissertationes variae physicae, medicae, botanicae* . . . 7 vols. Lugduni Batavorum, 1749-1769.
Vols. 3-7, first edition.
70. *Classes plantarum; seu, Systemata plantarum omnia a fructificatione desunta* . . . *Fundamentorum botanicorum pars* 2. Lugduni Batavorum, 1738.
71. *Critica botanica* . . . seu *Fundamentorum botanicorum pars II*. Accedit *Johannis Browallii. De necessitate historiae naturalis discursus*. Lugduni Batavorum, 1737.
72. *Flora lapponica*. Amstelædami, 1737.
73. *Flora svecica*. Stockholmiae, 1745.
74. *Flora zeylanica; sistens plantas indicas Zeylonæ insulae*. Holmiae, 1747.
75. *Hortus Cliffortianus; plantas exhibens quas in hortis tam vivis quam siccis, Hartecampi in Hollandia, coluit* . . . *Georgius Clifford* . . . Amstelædami, 1737.
76. *Hortus Upsaliensis, exhibens plantas exoticas, horto Upsaliensis academicae* . . . Vol. 1. Stockholm, 1748.
77. *Musa Cliffortiana florens Hartecampi 1736 prope Harlemum*. Lugduni Batavorum, 1736.
78. *Philosophia botanica in qua explicantur fundamenta botanica* . . . Stockholm, 1751.
79. *Species plantarum exhibentes plantas rite cognitatas ad genera relatas* . . . secundum systema sexuale digestas. Holmiae, 1753. 2 vols.

This book is the starting-point for the modern scientific names of plants, and for the uniform, systematic use of binomials in naming plants.

80. *An autograph letter written to the Duc du Chesne, recommending a friend and asking for seeds, signed "C. Linné."*

POST-LINNAEAN BOTANICAL CLASSICS

81. BROWN, ROBERT.

Observations on the organs and mode of fecundation in Orchideae and Asclepiadaceae. Reprint in *The Miscellaneous Botanical Work of Robert Brown* (Ray Society, London, 1866) of Brown's paper originally published in the *Transactions of the Linnean Society*, 16: 685-745. 1833.

It is in this paper that the discovery of the nucleus is first announced as an organ of the cell. "In each cell of the epidermis of a great part of this family [Orchideae] . . . a single circular areola, generally somewhat more opaque than the membrane of the cell, is observable . . . There is no regularity as to its place in the cell; it is not infrequently however central or nearly so . . . This areola, or nucleus of the cell as perhaps it might be termed, is not confined to the epidermis," etc.

82. [CHAMBERS, ROBERT]

Vestiges of the natural history of creation, with a sequel. New York, 1846. Anonymous reprint of the original London edition of 1844 advertised under the pseudonym, "Sir Richard Vyvyan, Bart., M.P., F.R.S., &c."

Did much to remove bias and prejudice against the idea of organic evolution. A storm of abuse that would otherwise have been added to what Darwin did receive, was diverted to the author of the *Vestiges*. "It is full of apt and forcible illustrations of pseudo-scientific realism" (Iluxley). "A time when there was no life is first seen. We then see life begin and go on . . . This is a wonderful revelation to have come upon the men of our time . . . The great fact established by it is, that the organic creation, as we now see it, was not placed upon the earth at once;—it observed a PROGRESS . . . We can imagine Divine power evoking a whole creation into being by one word; but we find that such had not been his mode of working in that instance [ontogeny], for geology fully proves that organic creation passed through a series of stages before the highest vegetable and animal forms appeared.

Here we have the first hint of organic creation having arisen in the manner of natural order." (page 216.)

From Darwin:

"Have you read that strange, unphilosophical, but capitally written book, the '*Vestiges*': it has made more talk than any work of late, and has been by some attributed to me . . ."

"Have you seen the slashing article of December 26 [1859] in the *Daily News*, against my stealing from my 'master,' the author of the '*Vestiges*?' (Darwin to Huxley.)

"I must think that such a book, if it does no other good, spreads the taste for Natural Science."

" . . . at other times I really feel as much ashamed of myself as the author of the '*Vestiges*' ought to be of himself."

From Huxley:

" . . . the only review I ever have qualms of conscience about, on the ground of needless savagery, is the one I wrote on the '*Vestiges*.'"

83. [CHAMBERS, ROBERT]

Explanations: A sequel to "Vestiges of the natural history of creation." New York, 1846.

"I am at the very first struck by the great *à priori* unlikelihood that there can have been two modes of Divine working in the history of nature—namely, a system of fixed order or law in the formation of globes and a system in any degree different in the peopling of these globes with plants and animals . . . it would require very decisive counter-evidence to forbid the conclusion that the organic creation originated in law."

84. GOETHE, J. W. VON.

Versuch die Metamorphose der Pflanzen zu erklären. 1790.
First edition.

Goethe recognized the homologies of different parts of the plant. "It is open to observation that certain exterior parts of plants sometimes change and pass into the form of adjacent parts, either wholly or in a greater or less degree." However, he confused abnormal with normal metamorphoses.

85. HEDWIG, JOHANNE.

Theoria generationis . . . plantarum cryptogamicarum Linnæi
 . . . 1784.

First edition.

A pioneer and important contribution to our knowledge of ferns, mosses, and other cryptogams. Hedwig is considered to be the founder of our scientific knowledge of Mosses (Bryology).

86. HILL, JOHN.

The British herbal . . . 1756.

First edition.

87. HOSACK, DAVID.

Hortus Elginensis: or, A catalogue of plants, indigenous and exotic, cultivated in the Elgin botanic garden, in the vicinity of New-York . . . 1811.

Second edition, enlarged.

Rockefeller Center, New York City, is on the site of this garden.

88. HOFMEISTER, WILHELM.

On the germination, development and fructification of the higher cryptogamia . . . trans. by Frederick Currey. 1862.

The marvelous results of researches on the reproduction of the lower plants. This is one of the most important botanical works of all time, and helped lay the foundations of our knowledge of the alternation of generations through the plant kingdom.

89. HUMBOLDT, ALEXANDER VON and AIMÉ DE BONPLAND.

Essai sur la géographie des plantes . . . 1805.

Second edition.

The foundation of the science of plant geography; the adaptation of plants to their environment, and the comparison of vegetation of different latitudes.

90. HUMBOLDT, ALEXANDER VON and AIMÉ DE BONPLAND.

Ideen zu einer Geographie der Pflanzen . . . 1807.

German translation of their *Essai sur la géographie des plantes* . . . This edition has a map which shows vegetation in relation to altitude—perhaps the first ever published.

91. HUMBOLDT, ALEXANDER VON.

Ideen zu einer Physiognomik der Gewächse. 1806.
First edition.

92. INGEN-HOUSZ, JOHN.

Experiments upon vegetables, discovering their great power of purifying the common air in the sun-shine, and of injuring it in the shade and at night. London, 1779.

* First edition.

Ingen-Housz acknowledges his indebtedness to Priestley as the source of his inspiration. His conclusions were "the result of above 500 experiments" (page xiii). He demonstrated that green plants take in carbon dioxide and give off oxygen, but *only in daylight*.

"One leaf of a vine, shut up in an ounce phial, full of air fouled by breathing so that a candle would not burn in it, restored this air to the goodness of common air in the space of an hour and a half. But plants enjoy this privilege only in the day-time, and when they grow in unshaded places" (page 39).

(Cf. Nos. 41, 97, 98, 101, 108.)

93. MENDEL, GREGOR.

Versuche über Pflanzen-Hybriden (in Naturforschender Verein. Brünn, (Austria). Verhandlungen. Vol. 4, 1866.)

The famous description of his experiments on peas, made by Mendel in the monastery garden at Brünn, was the foundation of the scientific study of heredity.

On page 21 there is an error of fact, since the first hybrid (F_1) generation of pea seeds (from a cross between "smooth" and "wrinkled" seed parents) are described as "smooth or wrinkled." Probably this error is due to careless preparation of MS. or careless proof-reading.

94. MOHL, HUGO VON.

Vermischte Schriften botanischen Inhalts. 1845.

A collection of the earlier works of the most important of the founders of plant cytology. von Mohl first used the term protoplasm (1846) in its modern sense, to describe the living substance of plants and animals.

95. PARMENTIER, [A. A.]

Traité sur la culture et les usages des pommes de terre, de la patate, et de topinambour . . . 1789.

First edition.

It was Parmentier who introduced the potato as an article of food into France.

96. PERSOON, C. H.

Icones pictae specierum rariorum fungorum in synopsi methodica descriptarum . . . 1803-08. 4 pts. in 1 vol.

First edition.

97. PRIESTLEY, JOSEPH.

Experiments and observations on different kinds of air. 1774.

First edition. (Vol. 1 only.)

Priestley, the discoverer of oxygen, made pioneer studies of the function of chlorophyll. He showed experimentally that plants cannot live in an atmosphere of carbon dioxide ("fixed air"), i.e., without oxygen. He rejected van Helmont's term "gas," as being a needless introduction of a new word, using instead the word "air" in a generic sense.

(Cf. Nos. 41, 92, 98, 101, 108.)

98. PRIESTLEY, JOSEPH.

Experiments and observations relating to various branches of natural philosophy. 1779.

First edition.

In Section XXVIII he describes a "quantitative" experiment showing that green plants may decrease the amount of carbon dioxide ("fixed air") and increase the amount of oxygen ("de-phlogisticated" air).

"On the 28th May I introduced a shoot of a strawberry plant into a jar containing air vitiated partly by the burning of candles, and partly by other means, till one measure of it and one of nitrous air occupied the space of 1.62 measures; and on the 10th of June this air was so far improved, that when it was tried in the same manner, the measures of the test were 1.4, and a candle did not immediately go out in it" (page 305).

(Cf. Nos. 41, 92, 97, 101, 108.)

99. PRINCE, WILLIAM.

Catalogue of fruit and ornamental trees . . . cultivated at the Linnean botanic garden . . . Flushing, N. Y. 1823.

The Prince nursery was one of the earliest and most important in America. It is stated that this nursery was the first to introduce *Mahonia* into American gardens.

100. PRINCE, WILLIAM.

A short treatise on horticulture . . . 1828.

101. SAUSSURE, NICOLAS THÉODORE DE.

Recherches chimiques sur la végétation. (Paris An XII.) 1804.

First edition.

Saussure established the fact that oxygen is indispensable to the life of the plant, and that all parts of the plant, in darkness as well as in light, take in oxygen and give off carbon dioxide—that is, they respire the same as do animals.

(Cf. Nos. 41, 92, 97, 98, 108.)

102. SCHLEIDEN, M. J.

Beiträge zur Phylogenesis. (In *Beiträge zur Botanik.* I. p. 121–159. Leipzig, 1844. Reprinted from Müller's *Archiv*, 1838. p. 137.)

¶ This is the paper usually cited as having given the suggestion and inspiration to Schwann for the elaboration of the epoch-making generalization, *the cell-theory*. Schwann, however, cites a paper by Schleiden published in October, 1837. Strange to say, the paper which laid the foundation of the cell-theory is largely devoted to “demonstrating” two errors of observation, one (page 149) that cells reproduce by the “formation of cells within cells” (not by cell-division as is now known). “The process of cell-formation, which I have just endeavored to describe in detail, is that which I have observed in most of the plants which I have investigated,” says Schleiden. The other error (page 128) is that the embryo develops at the tip of the pollen-tube. This is illustrated by numerous careful drawings from nature! Unfortu-

nately the former error was perpetuated by Schwann and persisted for some time thereafter.

103. SCHOUW, JOACHIM FREDERIC.

Naturschilderungen. Kiel, 1840.

German translation from the original Danish.

"Material nature has undergone a development. We have sought to demonstrate that the plant world and also the animal world shows evidence of an historical development," not having been created "at once," but "by degrees."

104. SCHOUW, JOACHIM FREDERIC.

The Earth, plants, and man. London, 1852.

English translation from the German (1823) by Arthur Hefrey, of this important pre-Darwinian discussion of the origin of species. Not in Pritzel.

105. SCHOUW, JOACHIM FREDERIC.

The origin of the existing vegetable creation. English translation by N. Wallich from the Danish. ("Transactions of the Meeting of Scandinavian Naturalists at Copenhagen in 1847." Appendix K, p. 119.) *Hooker's Journal of Botany and Kew Garden Miscellany* 2, No. 23: 321-326; No. 24: 373-377. 1850, and 3, No. 25: 11-14. 1851.

The existence of the same species of plant in widely separated countries is not due to migration from a "centrum" or single point of origin, but to the fact that "the same species has originally appeared in several, often far distant, places." ("Schouw's hypothesis.") This was earlier taught by Gmelin (1747), but was elaborated by Schouw.

"I look upon it as highly probable, if not absolutely demonstrated, that no species are any longer created."

106. SCHWANN, THEODOR.

Mikroskopische Untersuchungen über die Uebereinstimmung in der Struktur und dem Wachsthum der Thiere und Pflanzen. 1839.

The basis of the modern cell-theory—the foundation on which both animal and vegetable biology have developed.

107. SCHWANN, THEODOR.

Microscopical researches into the accordance in the structure and growth of animals and plants. Sydenham Society, London, 1847.

This is the English translation by Henry Smith of Schwann's epoch-making paper, *Mikroskopische Untersuchungen*, etc., published in 1839. One of the great classics in biology, "The object of the present treatise is to prove the most intimate connection of the two kingdoms of organic nature, from the similarity in the laws of development of the elementary parts of animals and plants . . . Schleiden communicated the results of his investigations to me previous to their publication in October, 1837," says Schwann. "The development of the proposition, that there exists one general principle for the formation of all organic productions, and that this principle is the formation of cells, as well as the conclusions that may be drawn from this proposition, may be comprised under the term *cell-theory*" (Schwann).

108. SENEBIER, JEAN.

Physiologie végétale . . . Geneva, 1800.

First edition.

Senelier made fundamental contributions to our understanding of the functions of respiration and photosynthesis. "Leaves restore to the air a part of the oxygen gas which animal life and various other circumstances take from it, as Priestley, Ingenhous, and I have shown."

(Cf. Nos. 41, 92, 97, 98, 101.)

109. SPALLANZANI, [LAZARO]

Expériences pour servir à l'histoire de la génération des animaux et des plantes . . . 1785.

First edition.

Helped to lay the foundation of the doctrine of biogenesis.

110. SPALLANZANI, [LAZARO]

Nouvelles recherches sur les découvertes microscopiques et la génération des corps organisés . . . 2 pts. in 1 vol. 1769.

One of the first experimental disproofs of the idea of spontaneous generation.

111. WALLACE, ALFRED RUSSEL.

Palm trees of the Amazon and their uses. 1853.

First edition.

ASSOCIATION BOOKS

112. ALPINUS, PROSPER.

Historia Aegypti naturalis . . . 1735.

Peter Collinson's copy with signatures on two title pages and page of text in his handwriting.

113. BOERHAAVE, HERMANN.

Index alter plantarum quae in horto academico Lugduno-Batavo aluntur. 2 pts. in 1 vol. 1720. First edition.

Author's presentation copy.

On title page "D. Isaaco Rand Botanico peritissimo amicitiae ergo mittit auctor."

114. CANDOLLE, AUGUST PYRAM [US] DE.

Plantes rares du jardin de Genève . . . 1829.

Author's presentation copy.

Letter and inscription to Mlle. Anastasia de Klustine, dated November 20, 1830. Letter signed A. P. de Candolle.

115. CRESCENZI, PIERO DE.

De agricultura vulgare. 1511.

Third Italian edition.

From the library of William Morris, with his bookplate.

116. DARLINGTON, WILLIAM.

Flora cestrica: an attempt to enumerate and describe the flowering and flicoid plants of Chester county . . . 1837.

Author's presentation copy: "Dr. F. Boott with the best respects of the Author."

A. L. S. of author inserted.

117. GRAY, ASA.

Manual of the botany of the northern United States, from New England to Wisconsin and south to Ohio and Pennsylvania inclusive. 1848.

Author's presentation copy. "Dr. Boott from his attached friend the Author." A. L. S. inserted.

118. GREW, NEHEMIAH.

Musaeum regalis societatis. Or, a catalogue of . . . rarities belonging to the Royal society . . . 1681. First edition.

This copy once belonged to Abigail Adams, wife of John Adams, who, in 1785, was first ambassador from the U. S. to the Court of St. James. It has also on the title page the signature of H. L. Piozzi (Hester Lynch Salisbury Piozzi), Dr. Johnson's friend, Mrs. Thrale.

119. HOOKER, JOSEPH DALTON.

Sketch of the life and labours of Sir William Jackson Hooker.

Has note: "Own copy J. D. H."

Inserted in this copy is a written list of persons to whom were sent copies of the Life of Sir W. J. Hooker.

120. MUNTING, ABRAHAM.

De vera antiquorum herba Britannica . . . 1681.

Signature of Joseph Miller, facing title page, and bookplate of the Society of Apothecaries.

121. PASTEUR, LOUIS.

Études sur la bière. 1876.

Author's autograph copy. (À Monsieur Van Tieghem. Souvenir affectueux. L. Pasteur.)

Pasteur's discovery that fermentation is caused by micro-organisms revolutionized the brewing industry, and laid the foundations of modern antiseptic surgery, the germ-theory of disease, soil science, the theory of crop-rotation--in fact, the whole science of bacteriology.

122. SCHWEINITZ, LUDWIG DAVID VON.

Synopsis fungorum Carolinae superioris secundum observationes . . . 1822.

On dedication page is the signature of A. Gray, Aug. 1885.

123. TORREY, JOHN and ASA GRAY.

A flora of North America . . . arranged according to the natural system. Vol. 1, pt. 1. 1838.

George Bentham's copy, from the authors.

124. VRIES, HUGO DE.

Intracellular pangensis. Original typewritten mss. with pencilled notes in the handwriting of Professor deVries and revisions by the translator, C. Stuart Gager. 1908.

Autograph letters, signed, by deVries and by Strasburger, regarding this translation.

MS., signed, in handwriting of Eduard Strasburger, of his *Introduction* to the translation. "The *Intracellulare Pangensis*, of Hugo de Vries, was such a source of stimulation to me at the time of its appearance that I feel greatly indebted to its author."

DARWINIANA

[DARWIN, ERASMUS] 1731-1802.

125. *The Botanic garden; a poem in two parts.* London, 1791.

First edition of part 1, second edition of part 2.

The grandfather of Charles Darwin here presents to his contemporaries the state of scientific knowledge in their day, together with glimpses of the coming world in which, as he knew, humanity would have changed its habits very greatly.

An illustration by William Blake.

"The work as a whole takes an extremely distinguished place among the best bad books in the language." (John Drinkwater.)

"*Bookseller*: Then it is not of any consequence whether the representations correspond with nature?"

Poet [Darwin]: Not if they so much interest the reader as to induce the reverie above described."

The persistent error that "leaves are the lungs of plants" is first (?) proposed and elaborated in this book: "The analogy between the leaves of plants and the lungs or gills of animals seems to embrace so many circumstances, that we can scarcely withhold our assent to their performing similar offices."

DARWIN, CHARLES ROBERT. 1809-1882.

126. *The descent of man, and selection in relation to sex.* First edition. London, 1871.

The first edition appeared on the day the treaty of peace was signed that ended the Franco-Prussian war—February 14, 1871.

"I was partly led to do this [book] by having been taunted that

I concealed my views, but chiefly from the interest which I had long taken in the subject."—*Darwin to A. de Candolle*.

"The 'Descent of Man' took me three years to write, but then as usual some of this time was lost by ill health, and some was consumed by preparing new editions and other minor works."—*Autobiography*.

"During many years I collected notes on the origin or descent of man, without any intention of publishing on the subject . . . as I thought that I should thus only add to the prejudices against my views."—*Introduction*.

127. *The different forms of flowers on plants of the same species*. First edition. London, 1877.

". . . no little discovery of mine ever gave me so much pleasure as the making out the meaning of heterostyled flowers."—*Autobiography*.

128. *The effects of cross and self fertilisation in the vegetable kingdom*. First edition. London, 1876.

Records one of the first recognitions and clear descriptions of "hybrid vigor."

"I was led to make, during eleven years, the numerous experiments, recorded in this volume, by a mere accidental observation; and indeed it required the accident to be repeated before my attention was thoroughly aroused to the remarkable fact that the seedlings of self-fertilised parentage are inferior, even in the first generation, in height and vigour to seedlings of cross-fertilised parentage."—*Autobiography*.

129. *The expression of the emotions in man and animals*. First edition. London, 1872.

Began January 17, 1871, "the last proof of the 'Descent of Man' having been finished on January 15." 5267 copies were sold on the day of publication.

". . . the subject is in no way an important one; it is simply a 'hobby-horse' with me, about twenty-seven years old."

"My first child was born on December 27, 1839, and I at once commenced to make notes on the first dawn of the various expressions which he exhibited, for I felt convinced, even at this early period, that the most complex and fine shades of expression must all have had a gradual and natural origin."—*Autobiography*.

130. *The formation of vegetable mould, through the action of worms, with observations on their habits.* First edition. London, 1881.

". . . I know not whether it will interest any readers, but it has interested me."—*Autobiography*.

8500 copies sold between November, 1881, and February, 1884.

131. *Insectivorous plants.* First edition. London, 1875.

". . . whenever I had leisure I pursued my experiments, and my book on 'Insectivorous Plants' was published in July, 1875—that is, sixteen years after my first observations."—*Autobiography*.
2700 copies were sold out of an edition of 3000.

"You ask about my book, and all I can say is that I am ready to commit suicide . . . I begin to think that everyone who publishes a book is a fool."—*Darwin to J. D. Hooker*.

". . . at the present moment I care more about *Drosera* than the origin of all the species in the world."—*Darwin to Lyell, November, 1861*.

132. *Journal and remarks.* London, 1839.

Being Vol. III of the Narrative of the surveying voyages of H.M.S. Adventure and Beagle . . . First edition. 1832–1836.

The voyage of the "Beagle" was, in Darwin's own words, "by far the most important event in my life, and has determined my whole career."

"The success of this, my first literary child, always tickles my vanity more than that of any of my other books."—*Autobiography*.

". . . my 'Journal of Researches' was seen in MS. by an eminent semi-scientific man, and was pronounced unfit for publication."—*Darwin, Life and Letters*. 2: 243.

133. *On the movements and habits of climbing plants.* London, 1867.

Read before a meeting of the Linnean Society, February 2, 1865. First published in its *Journal*. Vol. 9. Botany. pp. 1–118.

"I was led to take up this subject by reading a short paper by Asa Gray, published in 1858."—*Autobiography*.

134. *On the origin of species by means of natural selection.* First edition. London, 1859.

"My confounded book which half killed me."—*Darwin to J. D. Hooker, October 15, 1859.*

"Only an abstract."—*Darwin to Agassiz.*

"I find, alas! each chapter takes me on an average of three months, so slow I am."—*Darwin to Asa Gray, April 4, 1859.*

"Your glorious book."—*J. D. Hooker to Darwin.*

"It is the very hardest book to read, to full profits, that I ever tried— it is so cram-full of matter and reasoning."—*Hooker to Darwin, December, 1859.*

"I do not think twenty years too much time to produce such a book in . . . I am free to say that I never learnt so much from one book as I have from yours."—*Asa Gray, January 1, 1860.*

This book produced a revolution in human thinking, and ranks as one of the three or four greatest books of all time.

Widewell, the historian of science, refused to allow a copy of the *Origin* to be placed in the library of Trinity College, Cambridge, for some years.

135. *On the various contrivances by which British and foreign orchids are fertilised by insects.* First edition. London, 1862.

"On May 15, 1862, my little book on the 'Fertilisation of Orchids,' which cost me ten months' work, was published: most of the facts had been slowly accumulated during several previous years . . . my interest in [the subject] was greatly enhanced by having procured and read in 1841, through the advice of Robert Brown, a copy of C. K. Sprengel's wonderful book, 'Das entdeckte Geheimniss der Natur'."—*Autobiography.*

136. *The power of movement in plants*. First edition. London, 1880.

"In 1880 I published, with Frank's (his son, Francis Darwin) assistance, our 'Power of Movement in Plants.' This was a tough piece of work."—*Autobiography*.

137. *The variation of animals and plants under domestication*. 2 vols. First edition. London, 1868.

First published January 30, 1868, 1500 copies sold in one week. A second edition appeared in February of the same year.

"I have sent the MS. of my big book, and horridly, disgustingly big it will be, to the printers."—*Darwin to Huxley*.

"It has been an awful job: seven and a half months correcting the press."—*Darwin to J. D. Hooker*.

"It was a big book and cost me four years and two months of hard labor . . . Towards the end of the work I give my well-abused hypothesis of Pangenesis."—*Autobiography*.

"The chapter on what I call Pangenesis will be called a mad dream . . . but at the bottom of my own mind I think it contains a great truth."—*Darwin to Asa Gray*.

"The greater part, as you will see, is not meant to be read."—*Darwin to Fritz Müller*.

"About my book I will give you a bit of advice. Skip the *whole* of Vol. I., except the last chapter (and that need only be skimmed) and skip largely in the 2nd volume; and then you will say it is a very good book."—*Darwin to J. D. Hooker*.

138. BULLER, SIR WALTER L.

Illustrations of Darwinism, and other papers. (Repr. Transactions of the New Zealand Institute, Vol. 27, 1895.)

Presentation copy "From the Author" (to J. D. Hooker).

139. CANDOLLE, ALPHONSE DE.

Darwin considéré au point de vue des causes de son succès . . . Genève, 1882.

Presentation copy "À Sir Joseph Hooker de la part de l'auteur."

140. CARPENTER, W. B.

Charles Darwin: his life and work. (Repr. from *The Modern Review*, July, 1882.)

Presentation copy "Sir Joseph D. Hooker from his friend the Author."

141. CRAWFURD, JOHN.

On the theory of the origin of species by natural selection in the struggle for life. London, 1868.

Presentation copy "J. D. Hooker from the Author."

142. DARWIN, CHARLES ROBERT.

Extracts from letters addressed to Professor Henslow.

They were printed for distribution among members of the Cambridge Philosophical Society and read at a meeting on the 16th of November, 1835. Dawson Turner's autographed copy, given him by Professor Adam Sedgwick, 1836. Contains an A. L. S. of Sedgwick.

143. DARWIN, CHARLES ROBERT.

Manuscript in Darwin's hand, giving his own comments on the article by the Bishop of Oxford concerning the Origin of Species.

144. DARWIN, CHARLES [ROBERT]

Notes on the fertilization of orchids.

Presentation copy "From the Author."

145. HOPKINSON, JOHN.

Charles Darwin: an address . . . Hertford, 1893.

Presentation copy "Sir J. D. Hooker. With the Author's Compliments."

146. JACKSON, BENJAMIN DAYDON.

Darwiniana: being a reprint of three short essays prepared for the Darwin centenary held at Cambridge, June 22-24, 1909.

Contains a list of plants named after Darwin.

147. SYMONDS, REV. W. S.

A lecture on progress and development. London, n d.

Presentation copy "J. D. Hooker from the Author."

148. [WILBERFORCE, BISHOP OF OXFORD]

"*On the origin of species, by means of natural selection . . .*
London, 1860."

This is the virulent review of the *Origin of Species* which appeared in the *Quarterly Review*, 108, No. 15: p. 25-264. July, 1860. The authorship was afterwards acknowledged by Samuel Wilberforce, then Bishop of Oxford. The article is accompanied by a seven-page MS. in the handwriting of Charles Darwin (Cf. No. 143) refuting the extraordinary statements in the *Review*. These notes were prepared by Darwin for Sir Joseph Hooker, and suggest points of attack against the Bishop. This appears to be the actual copy of the article in Hooker's hands in his speech at the now famous meeting of the British Association in Oxford, July, 1860, when the Bishop ("Sam Oxon") was dramatically refuted by Huxley, Hooker, and others.

" . . . a most ridiculous article," wrote Hooker, "absurd for its egregious ignorance and blunders in Nat. Science."

"I swore to myself," said Hooker, "that I would smite the Amalekite, Sam, hip and thigh if my heart jumped out of my mouth . . ."

Portraits

149. Photograph of Charles Darwin at the age of 73, taken in 1881.
150. Caricature of Charles Darwin. A colored print from *Vanity Fair*, September 30, 1871.

Autographs

151. A letter to the Secretary of the British Association.
152. Note taken from a scrapbook belonging to Charles Cardale Babington, St. Johns College, Cambridge.
153. A letter [to Dr. Davy (?)].

AUTOGRAPHS AND AUTOGRAPHED LETTERS

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| 154. BOUSSINGAULT, JEAN
BAPTISTE-JOSEPH | 168. HUMBOLDT, ALEXANDER
VON |
| 155. BRONGNIART, A. T. | 169. HUXLEY, THOMAS HENRY |
| 156. BROWN, ROBERT | 170. LAVOISIER, ANTOINE LAU-
RENT |
| 157. DARLINGTON, WILLIAM | 171. LINDLEY, JOHN |
| 158. DARWIN, CHARLES [ROB-
ERT]
Exhibited with Darwiniana. | 172. LINNÉ, CARL VON
Exhibited with other Linné
items. |
| 159. DARWIN, ERASMUS | 173. MICHAUX, F. ANDRÉ |
| 160. DAVY, SIR HUMPHRY | 174. MIRBEL, CHARLES |
| 161. DE CAISNE, JOSEPH | 175. PARMENTIER, ANTOINE
AUGUSTIN |
| 162. DURAND, ELIAS | 176. PERSOON, CHRISTIAN
HENDRIK |
| 163. GRAY, ASA | 177. SACCARDO, PIER ANDREA |
| 164. HALES, STEPHEN | 178. SOWERBY, JAMES DE
CARLE |
| 165. HOOKER, SIR JOSEPH D. | 179. WATSON, SERENO |
| 166. HOOKER, SIR WILLIAM
JACKSON | |
| 167. HOSACK, DAVID | |

PUBLICATIONS ISSUED BY THE BROOKLYN BOTANIC GARDEN

180. THE AMERICAN JOURNAL OF BOTANY.

Official organ of the Botanical Society of America. Devoted to all branches of botanical science. Established, January, 1914.

181. ECOLOGY.

The official publication of the Ecological Society of America. All forms of life in relation to environment. Established, January, 1920.

182. GENETICS.

A periodical record of investigations bearing on heredity and variation. Established, January, 1916.

183. BROOKLYN BOTANIC GARDEN CONTRIBUTIONS.

Papers originally published in periodicals, reissued as "separates" without change of paging and numbered consecutively. Established, April 1, 1911.

184. BROOKLYN BOTANIC GARDEN LEAFLETS.

The purpose of the Leaflets is to give announcements concerning flowering and other plant activities to be seen in the Garden near the date of issue, and to give popular, elementary information about plant life for teachers and others. Established, April 10, 1913.

185. BROOKLYN BOTANIC GARDEN MEMOIRS.

Published irregularly. Established, July, 1918.

186. BROOKLYN BOTANIC GARDEN RECORD.

An administrative periodical, issued quarterly, and containing, among other things, the *Annual Report* of the director and heads of departments, special reports, announcements of courses of instruction, seed list, guides, miscellaneous papers, and notes concerning Garden progress and events. Established, January, 1912.

BROOKLYN BOTANIC GARDEN RECORD

VOL. XXIV

OCTOBER, 1935

NO. 4

PROSPECTUS: 1935-36

I. COOPERATION WITH LOCAL SCHOOLS

The Brooklyn Botanic Garden aims to cooperate in every practicable way with the public and private schools of Greater New York in all matters pertaining to the study of plants and closely related subjects. The purpose of the Garden in this connection is to supplement and enrich the school work in the way of instruction, demonstration methods, study material, etc., which otherwise would not be available.

Geography classes, as well as classes in nature study and botany, find the collection of useful plants in the economic plant house, the Local Flora Section, the Japanese Garden, and also the Meridian Panel, the Armillary Sphere, and the Labelled Boulders, valuable adjuncts to their class work. Arrangements may be made by teachers of geography to have their classes study these collections under guidance. Illustrated lectures for geography classes may also be arranged for at the Garden.

To ~~visiting~~ college classes in geology and physiography the Botanic Garden offers interesting material for a study of glaciation. Notable features are a portion of the Harbor Hill terminal moraine (Boulder Hill), the morainal pond (the "Lake"), the labelled glacial boulders, and the Flatbush outwash plain. See Guide No. 7, "*The Story of our Boulders: Glacial Geology of the Brooklyn Botanic Garden.*" See also pages 222-224 for statements concerning the Labeled Glacial Boulders, the Meridian Panel, and the Armillary Sphere.

A. Talks at Elementary Schools.—The principals of public or private elementary schools may arrange to have talks given at

the schools on various topics related to plant life, such as school gardens and garden work with children, tree planting, the conservation of wild flowers, Arbor Day, etc. If an illustrated lecture is desired, the lantern and operator must be provided by the school, but slides will be furnished by the Botanic Garden. Address the *Curator of Elementary Instruction* for a list of talks and for appointments.

B. Talks at Secondary Schools and Colleges.—Informal illustrated talks on various subjects of an advanced botanical nature have been given for many years at Secondary Schools and Colleges by members of the staff. Arrangements for such talks should be made with the *Curator of Public Instruction*.

C. School Classes at the Garden.—(a) Public or private schools may arrange for classes, accompanied by their teachers, to come to the Botanic Garden for illustrated lectures either by the teacher or by a member of the Garden Staff.

(b) Notice of such a visit should be sent at least *one week* previous to the date on which a talk is desired. Blank forms are provided by the Garden for this purpose. These talks will be illustrated by lantern slides, and by the conservatory collection of useful plants from the tropics and subtropics. Fall and spring announcements of topics will be issued during 1935-36.

(c) The Garden equipment, including plant material, lecture rooms, lantern, and slides, is at the disposal of teachers who desire to instruct their own classes at the Garden. Arrangements must be made in advance so that such work will not conflict with other classes and lectures. For High School and College classes address the *Curator of Public Instruction*. For Junior High and Elementary School classes address the *Curator of Elementary Instruction*.

(d) The principal of any elementary or high school in Brooklyn may arrange also for a series of six lessons on plant culture to be given to a class during the fall or spring. A small fee is charged to cover the cost of the materials used. The plants raised become the property of the pupils. The lessons will be worked out for the most part in the greenhouse, and the class must be accompanied by its teacher. This is adapted for pupils above the third grade.

D. Seeds for School and Home Planting.—Penny packets of seeds are put up by the Botanic Garden for children's use. In

1935 more than 1,000,000 packets were distributed. In the early spring, lists of these seeds, order blanks for teachers and pupils, and other information may be secured on application to the *Curator of Elementary Instruction*.

E. Conferences.—Conferences may be arranged by teachers and principals for the discussion of problems in connection with gardening and nature study. Appointments must be made in advance. Address the *Curator of Elementary Instruction*.

F. Study and Loan Material.—To the extent of its facilities, the Botanic Garden will provide, on request, various plants and plant parts for study; also certain protozoa and sterilized nutrient agar. When containers are necessary, as in the case of agar, algae, and protozoa, they must be furnished by the school.

In the past, the Garden has offered this service gratis, but both on account of the increasing demand and because of the decrease in appropriations, it has become necessary to make a small charge for the material supplied or loaned. This charge will be made only for material furnished to junior high schools, high schools, and colleges. As far as possible, material will continue to be supplied gratis to elementary schools in case one or more of their teachers are members of regular Botanic Garden classes. A Price List of the various materials furnished will be mailed on request.

Requests for high school and college material should be made by mail or telephone (PRospect 9-6173), at least a day in advance, to the School Service Assistant. Requests for elementary school material should be made to Miss Elsie T. Hammond, and should be called for at the Information Booth on the ground floor. High school and college material should be called for at Room 327.

MATERIAL USUALLY AVAILABLE

1. Algae:

Pleurococcus

Spirogyra

Vaucheria

Desmids

Blue-green algae: Oscillatoria and others.

2. Fungi:

Forms of fungi and lichens.

Plus and minus strains of bread mold.

Smut of oats or wheat.

Black stem rust of wheat.

3. Liverworts: *Conocephalum* and *Lunularia*.

4. Moss plants: protonema "felt," and capsules.

5. Ferns:

Prothallia: for these a covered Petri dish or tin box should be sent.

Fronds with spores.

6. *Selaginella* with sporophylls.

7. *Elodea*—to show movement of protoplasm.

8. Corn or sorghum stems, dried.

9. Twigs to show opposite or alternate arrangement of buds.

10. Simple and compound leaves.

11. Various seeds and fruits to illustrate methods of dispersal.

12. Material for the study of genetics:

Pods of Jimson weed showing inheritance of both smooth and spiny pods.

Sorghum seeds for demonstrating inheritance of red seedling color.

Pea seeds to show Mendelian seed and seedling characters.

13. Sensitive plants (*Mimosa pudica*).

14. Protozoa: *Paramecium*, *Euglena*, and others.

15. Fruit flies (*Drosophila*), wild type and mutants, transferred to bottles of culture medium supplied by applicant.

Specimens Loaned for Exhibit.

16. Leguminous roots with tubercles.

17. Riker mounts of powdery mildew, rusts and smuts, maple tar spot.

18. Riker mounts of peas showing inheritance of seed characters.

19. Oats showing inheritance of hull color.

20. Corn showing inheritance of endosperm colors.

21. Sorghum varieties and the F_1 hybrid.

22. Types of cereals: wheat, oats, barley, rye, rice, corn.

23. Eight types of wheat.

24. Eight types of barley.

25. Riker mounts of types of modified leaves.

26. Geranium, Coleus, Tradescantia—variegated green and white, for photosynthesis experiment.

Sterilized Agar

27. Petri dishes sent in *clean and dry* ten days in advance, or test tubes or flasks sent in one week in advance, will be filled with sterilized nutrient agar for the study of bacteria and molds.

G. Demonstration Experiments.—Teachers may arrange to have various physiological experiments or demonstrations conducted at the Garden for the benefit of their classes. Communications in regard to these matters should be addressed to the *Curator of Public Instruction*.

H. Loan Sets of Lantern Slides.—Sets of lantern slides have been prepared for loan to the schools. Each set is accompanied by a short lecture text of explanatory nature. In all cases these sets must be called for by a responsible school messenger and returned promptly in good condition. Address, by mail or telephone, Mr. Frank Stoll. The subjects now available are as follows. Other sets are in preparation.

- | | |
|------------------------|----------------------------------|
| 1. Plant Life | 4. Fall Wild Flowers |
| 2. Spring Wild Flowers | 5. Forestry |
| 3. Common Trees | 6. Conservation of Native Plants |

II. BUREAU OF PUBLIC INFORMATION

Consultation and advice, and the facilities of the library and herbarium are freely at the service of members* of the Botanic Garden and (to a limited extent) of others with special problems relating to plants or plant products, especially in the following subjects:

1. Plant diseases and determination (naming) of fungi.
2. Plant geography and ecology.
3. Determination of flowering plants.
4. The growing of cultivated plants and their arrangement; also their adaptation to soils, climate, and other factors.
5. The care of trees, shrubs, and lawns, and general gardening problems.

* For information about membership consult pages v-vii of this PROSPECTUS.

Inquiries should be directed to the *Curator of Public Instruction*, preferably by letter.

Determination of Specimens.—If the identification of plants is desired, the material submitted should include flowers, and fruit when obtainable. Identification of a single leaf is often impossible. For identification of plant diseases, representative portions of the part diseased should be sent.

III. DOCENTRY

To assist members and others in studying the collections, the services of a docent may be obtained. Arrangements should be made by application to the *Curator of Public Instruction* one week in advance. No parties of less than six adults will be conducted. This service is free of charge to members; to others there is a charge of 50 cents per person. For information concerning membership in the Botanic Garden see pages v-vii of this PROSPECTUS.

IV. COURSES OF INSTRUCTION

Except courses A23 and A29, each of the courses here announced is a unit and not a series of unrelated lectures. Students must enroll for an *entire course*. With the exceptions noted, no registrations will be made for separate class exercises.

Courses of instruction are offered in Botany, Horticulture, and Nature Study, and are divided into four classes:

- A. For members and the general public ("A" courses, p. 201)
- B. For teachers ("B" courses, p. 205)
- C. For children ("C" courses, p. 208)
- D. Other courses of a special nature ("D" courses, p. 209)
- E. Research courses ("E" courses, p. 209)

No course will be given when less than ten persons apply for registration. Since registration in many of the courses is restricted to a fixed number on account of the limited space available in the greenhouses, and for other reasons, those desiring to attend are urged to send in their application for enrollment and the entrance fee to the Secretary, Brooklyn Botanic Garden, several days in advance of the first exercise. This avoids delay at the beginning of the first exercise, ensures a place in the course, and enables the instructor to provide adequate material for the class.

Field Excursions.—When courses of instruction involve field excursions, these excursions are open only to those who have enrolled for the entire course.

Enrollment.—Persons are requested not to register in any course unless they are reasonably confident that they can attend the sessions of the class regularly and throughout. This is especially important where the number to be enrolled is limited. To register and not attend will quite certainly deprive someone else of the privilege of attending.

Equipment available for the courses:

1. Three *Classrooms* (in addition to the Boys' and Girls' Club Room in the Laboratory Building), equipped with stereoscopes and views, a stereopticon, plant collections, economic exhibits, models, and other apparatus and materials for instruction.

2. Two *Laboratory Rooms*, with the usual equipment for plant study.

3. Three *Instructional Greenhouses*, for the use of juvenile as well as adult classes, for instruction in plant propagation and related subjects.

4. The *Children's Garden*, on a piece of land about three-quarters of an acre in extent, in the southeast part of the Botanic Garden, divided into about 150 plots which are used throughout the season for practical individual instruction in gardening.

5. The *Children's Building*, near the north end of this plot, containing rooms for conferences and for the storage of tools, seeds, notebooks, special collections, etc.

6. The *Auditorium*, on the ground floor, capable of seating 570 persons, and equipped with a motion-picture machine and stereopticon, and electric current, gas, and running water for experiments connected with lectures.

In addition to these accommodations, the dried plant specimens in the herbarium, the living plants in the conservatories and plantations, and the various types of gardens, are readily accessible; while the main library and children's library, which contain a comprehensive collection of books on every phase of gardening and plant life, may be consulted freely at any time. See also pages 214–222.

A. Courses for Members and the General Public

Although the following courses are designed especially for Members of the Botanic Garden, they are open (unless otherwise

specified) to any one who has a general interest in plants. Teachers are welcome. Starred courses (*) are open also for credit to students of Long Island University, and are described in the current Long Island University catalog. In harmony with an agreement entered into in the spring of 1935, the Botanic Garden, upon recommendation of the Chairman of the Biology Department of Long Island University, offers a course scholarship to one student of the University.

Unless otherwise specified, all "A" courses are *free to members*,† but the individual class exercises are open only to those who register for the entire course. Of others a fee is required, as indicated. In courses where plants are raised, these become the property of the class members.

A1. Plants in the Home: How to Grow Them.—Five talks with demonstrations. This course deals with the principles to be followed in raising plants. Practice in potting, mixing soils, making cuttings, etc. The members of the class have the privilege of keeping the plants they have raised. *On account of restricted space in the greenhouse, this class must be limited to 40. Registration according to the order of application. Fee to non-members, \$6 (including laboratory fee); to members, \$1 laboratory fee. Wednesdays, 11 a.m., November 6 to December 11. (Omitting November 27.)* Mr. Free.

***A5. Trees and Shrubs of Greater New York: Fall Course.**—Ten outdoor lessons in the parks and woodlands of Greater New York on the characteristics of our common trees and shrubs, both native and cultivated, emphasizing their distinguishing features in the winter condition. *Fee, \$5. Saturdays, 2:30 p.m.; September 28 to December 14. (Omitting October 12 and November 30.)* The first session will be held at the Brooklyn Botanic Garden.

Dr. Graves and Miss Vilkomerson.

***A9. Trees and Shrubs of Greater New York: Spring Course.**—Ten outdoor lessons in the parks and woodlands of Greater New York. Similar to the preceding, except that the different species are studied in their spring and summer conditions.

* Accepted for credit in Long Island University.

† For information concerning membership in the Brooklyn Botanic Garden consult pages v-vii.

Fee, \$5. Saturdays, 2:30 p.m., April 4 to June 20. (Omitting April 11 and May 30.) Dr. Graves and Miss Vilkomerson.

A11. Flowering Plants and Ferns of the New York Region: Spring Course.—Six sessions, in the Brooklyn Botanic Garden and in the woodlands near the City, for field identification of spring flowers and ferns. *Fee, \$3. Saturdays, 9:30 a.m., April 25 to June 13. (Omitting May 16 and 30.)* Miss Rusk.

A13. Flowering Plants and Ferns of the New York Region: Fall Course.—Five sessions. Field identification of the common plants of wood and roadsides, including identification of seeds and fruits. *Fee, \$2.50. Saturdays, 9:30 a.m., September 14 to October 26. (Omitting September 21 and October 12.)* The first meeting will be held at Englewood Cliffs, N. J. Miss Rusk.

A20. Advanced Course in Gardening.—Ten lessons. This course presupposes a knowledge of the elements of gardening equivalent to that contained in courses A1 and A25. It consists of lectures illustrated with lantern slides and living material, and includes frequent tours in the Brooklyn Botanic Garden where the various types of gardens and other subjects of the lectures are demonstrated. *(Not offered in 1936.)* Mr. Free and Dr. Reed.

A23. Flower Arrangement. Sponsored by the Woman's Auxiliary. Five sessions. In cooperation with the Metropolitan Museum of Art. The principles of effective flower arrangement, the importance of color, and the choice of containers will be discussed and demonstrated by prominent guest speakers. A demonstration of effective backgrounds for flower arrangements will be given at the Museum for one of the sessions. The guest speakers include Mrs. William H. Cary, Miss Grace Cornell of the Metropolitan Museum, Mrs. Roy M. Lincoln, and Miss Hazel Heissenbuttle. This course is free to members of the Botanic Garden and the Metropolitan Museum. *Fee to non-members \$6. Single lectures \$1.25. Wednesdays at 11:00 a.m., January 8 to February 5.* For further information address Mrs. Whitney Merrill.

A25. Fundamentals of Gardening.—A course in first principles, for those who desire to carry on practical work in their own gardens and to start seedlings in the greenhouse. The lessons are as follows:

Making cuttings of plants for use in the outdoor garden.
 Planting seed in the greenhouse.
 Planning the garden.
 Pricking out seedlings in the greenhouse.
 The garden soil.
 Outdoor lesson.

Class limited to 60 members. Fee to non-members, \$7 (including laboratory fee); to members, \$2 laboratory fee. Wednesdays, 10:30 a.m., March 11 to April 15. Miss Shaw and Assistant.

A29. Practical Gardening.—An evening course for men and women. Five talks with demonstrations. Subjects discussed are: Soil management; planting; pruning; combatting plant pests; plant propagation, including budding and grafting. At the close of each session the class will be afforded an opportunity to bring up special garden problems for discussion. *Fee, \$4; single lecture, \$1. Monday evenings, 8 p.m., February 3 to March 2. Mr. Free.*

***A30. Ornamental Shrubs: Spring Course.**—Ten outdoor sessions held on the grounds of the Brooklyn Botanic Garden, dealing with the shrubs used in ornamental planting. More than two hundred species and varieties of shrubs are studied at the time of flowering. *Class limited to 25 members, enrolled in order of application. Fee, \$5. Wednesdays, 4 p.m., April 15 to June 17. Mr. Doney.*

***A31. Ornamental Shrubs: Fall Course.**—Ten sessions, about eight of which are held outdoors in the Brooklyn Botanic Garden, for the purpose of becoming acquainted with the common species and varieties of cultivated shrubs. Fall flowers and fruits of ornamental shrubs and small trees, also evergreen shrubs, are studied. This is a continuation of the spring course. *Class limited to 25 members, enrolled in order of application. Fee, \$5. Wednesdays, 4:15–5:30 p.m., October 2 to December 4.*

Mr. Doney.

***A32. Plant Families: Spring Course.**—Ten outdoor sessions in the Brooklyn Botanic Garden. This course treats of the structure and possible lines of evolution of flowers, and the characteristics of important families of flowering plants, such as the Magnolia, Buttercup, Rose, Pea, Mustard, Pink, Geranium, Mal-

low, Carrot, Heath, Potato, Figwort, Mint, Honeysuckle Composite, and Lily Families. (*Not offered in 1936.*)

Dr. Gundersen.

***A33. Plant Families: Fall Course.**—Eight sessions, six outdoors in the Botanic Garden, in continuation of the spring course (A32), for a study of the fall flowers and fruits and the vegetative characters of the different families of flowering plants. The two last exercises are illustrated lectures on plant-animal interdependence in evolution. *Fee, \$4. Wednesdays, 4 p.m., September 25 to November 13.*

Dr. Gundersen.

A36. Junior Garden Work.—A course planned primarily for members of garden clubs and women's clubs desirous of starting children's junior garden work. Four lessons as follows:

Preparation for outdoor garden work.

Garden plans for young people.

Starting plants indoors.

How to lay out the garden.

How to plant.

General management of children's garden work.

Fee, \$2, to cover cost of materials. Thursdays, 10:30 a.m., February 20 to March 12.

Miss Shaw and Miss Miner.

A37. Lilacs.—Four outdoor lessons on the grounds of the Botanic Garden. About one hundred varieties and fifteen species will be studied at their time of flowering. *Fee, \$2. Thursdays, 10:30–11:45 a.m., May 7 to May 28.*

Dr. Gundersen.

B. Courses for Teachers: Given in Cooperation with the Brooklyn Teachers Association

These courses have been accepted by the Brooklyn Teachers Association, and appear in its Syllabus of Courses. On satisfactory completion of each course, the student is awarded a certificate by the Brooklyn Teachers Association, in cooperation with the Brooklyn Botanic Garden. The courses are also accepted by the New York Board of Education for credit toward higher teaching licenses, one credit being granted for each 15 hours (with the exception of "B8, Plant Culture"). Through an agreement with Long Island University, undergraduate credit for certain courses

will be allowed toward fulfilling the requirements for a university degree, provided the admission requirements at the University and the laboratory requirements have been fulfilled. Such courses are starred (*). By special arrangement with the institution concerned, these credits have also been used as undergraduate credits in other colleges and universities. Nature materials used in the courses, and plants raised become the property of the student.

Members of the Garden are entitled to a 50 per cent. discount from the regular fee for all "B" courses; from other persons the indicated fee is required. Long Island University students desirous of electing any of these or of the "A" courses should notify Dean Tristram W. Metcalfe or Dr. Ralph H. Cheney, who will give the candidate a card entitling him to admission to the course. The student should present this card at the beginning of the first session of the course. *No course will be given when less than ten persons apply.*

B1. General Botany.—A two-year course of thirty class meetings and thirty two-hour laboratory periods each year. The first year (A) is spent on the structure and functions of the higher plants. The second year (B) deals with the structure, life histories, and relationships of the lower groups: bacteria, algae, fungi, lichens, mosses, and ferns. Four credits each year. In 1935-36 the second half (B) will be given. The first half is not a prerequisite for the second. *Fee, \$10 each year. Tuesdays, 4 p.m., beginning September 17, and Fridays, 4-6 p.m., beginning September 20.* Miss Rusk.

B2 (a). Nature Study.—A thirty-hour course in fifteen two-hour sessions, including field work. This course is based on the New York City Syllabus on Nature Study for the elementary grades, and is planned to acquaint the student with botanical nature material, and to be of specific help in setting up nature rooms and planning lessons. Two credits. *Fee, \$10. Tuesdays, 4-6 p.m., beginning September 24.* Miss Hammond and Miss Miner.

B2 (b). Nature Study.—A spring course similar to B2 (a). Miss Farida Wiley, of the American Museum of Natural History, will conduct a field lesson on bird study on a date to be announced. Two credits. *Fee, \$10. Tuesdays, 4-6 p.m., beginning February 18.* Miss Hammond and Miss Miner.

B3. Principles of Horticulture.—Thirty sessions. *For teachers only.* Lessons in potting and general care of house plants; methods of plant propagation, including the planting of bulbs; making cuttings (soft wood, and leaf); sowing seeds; preparing for the outdoor garden. Most of this work is carried on in the greenhouses. Emphasis will be laid on problems of a practical nature. Two credits. *Fee, \$10. Wednesdays, 4 p.m., beginning September 25.* Miss Shaw and Assistant.

B7. Greenhouse Work.—Thirty sessions. *For teachers only.* A continuation of Principles of Horticulture and open to students who have taken B3. Further study of plant-propagation methods: arrangement of plants in hanging baskets, window boxes, dishes, etc.; special culture of certain house plants and winter-flowering greenhouse plants. Mr. L. Gordon Utter will give four lectures, with demonstrations and practical work in methods and results of plant breeding. Two credits. *Fee, \$10. Tuesdays, 4 p.m., beginning September 24.* Miss Shaw.

B8. Plant Culture.—A course of twenty weeks duration for those who have taken B3 and B7. Work entirely in the greenhouse. No Board of Education credits are given for this course. *Fee, \$10. Thursdays, 4 p.m., beginning October 17.* Miss Shaw.

***B10. Flowering Plants: Field and Laboratory Study.**—Thirty sessions. The object of this course is to become acquainted with species of wild flowering plants (including weeds), and to learn how to identify them. Field and laboratory work are distributed according to the weather, the season, and the needs of the class. The field work is done largely in the Brooklyn Botanic Garden. The laboratory work consists of examining flowering plants and identifying them by means of a key, and of pressing, drying, and mounting plants for permanent specimens. Prerequisite: an elementary course in botany. Two credits. *Fee, \$10. Wednesdays, 4-6 p.m., beginning September 11.* Miss Rusk.

***B13-14. Trees and Shrubs of Greater New York.**—Twenty two-hour sessions. A course of outdoor lessons in the parks and woodlands of Greater New York, the principal object being to gain a ready acquaintance with the common trees and shrubs of the eastern United States, which are well represented in this region. The species are considered in systematic order, in both winter and

summer conditions, and the features pointed out by which they may most easily be recognized. Two credits. This course is the same as **A5** and **A9**, and is therefore *free to members of the Garden*. *Fee to non-members, \$10. Saturdays, 2:30 p.m., September 28 to December 14; and April 4 to June 20. (Omitting October 12, November 30, April 11, and May 30.)*

Dr. Graves and Miss Vilkomerson.

***B15-16. Economic Plants.**—Thirty sessions. The most important economic plants of the world are considered—their history, culture, formation of their useful products, and the extraction and preparation of the latter by man. Herbarium specimens and other material, as well as living plants in the conservatories and plantations of the Garden will be used for demonstrations. Because of its practical applications, this course will be of special value to teachers. Two credits. *Fee, \$10. Mondays, 4 p.m., beginning October 7.*

Dr. Cheney.

B17. Genetics.—Thirty class meetings and fifteen 2-hour laboratory periods. An introductory course in heredity and variation, including discussion of Mendelian principles, the physical basis of heredity, sex linkage, factor linkage, factor interaction, and quantitative inheritance. Laboratory work on plant material and *Drosophila*. Prerequisite: an elementary course in botany. Three credits. *Fee, \$10. Mondays, 4 p.m., beginning September 16; and Thursdays, 4-6 p.m. (laboratory), beginning in December or January.*

Miss Rusk.

C. Children's Courses

Saturday morning classes for boys and girls are open to children from eight to nineteen years old. Children are grouped in these classes according to age and experience.

Miss Shaw and Assistants.

I. The Fall Course takes up nature study on the grounds; plant propagation in the greenhouses, using stem and leaf cuttings; bulbs and corms; making of terrariums and dish gardens. Enrollment limited to 175 children. *Fee, ten cents. Saturday mornings, 9-11:15, October 19 to December 21.*

II. Winter Course.—Children who have shown unusual ability are chosen from the fall group for winter work. Introduction

to the observation of plants through the microscope; propagation projects; study of economic plants; plans for summer flower borders, involving a liberal use of the Children's Library; flower games, etc. Group limited to 50. *No fee. Saturday mornings, 9-11:15, February 1 to March 7.*

III. Spring Course.—Nature study and preparation for the outdoor garden, including studies of seed germination, seed sowing in the greenhouse, and the making of garden plans. All candidates for the outdoor garden must be in spring classes. Enrollment limited to 200. *Fee, ten cents. Saturday mornings, 9-11:15, March 14 to April 18.*

IV. Summer Garden Course.—The outdoor garden is open throughout the summer season, and hours arranged to fit in with children's vacation schedules. No child is assigned an outdoor garden who has not had the spring preparatory work. Group limited to 200 children. *Fee, twenty-five or thirty-five cents, depending on the size of the garden. The garden session begins April 25. The head garden teacher is Miss Miner.*

D. Course for Student Nurses

D1. General Botany With Special Reference to Medicinal Plants.—A course of 10 spring and 10 fall lectures, demonstrations, and field trips for student nurses. Arranged in cooperation with various hospitals. The general principles governing the life of plants, as well as the use and care of flowers and potted plants in the sick room, will be considered. Special attention will be paid to the identification of officinal plants in the field. Hours to be arranged. *No fee.* Dr. Graves.

E. Investigation

1. Graduate Work for University Credit

By the terms of a cooperative agreement between New York University and the Brooklyn Botanic Garden, properly qualified graduate students may arrange to carry on independent investigations in botany at the Garden under the direction of members of the Garden Staff, who are also officers of instruction in the Graduate School of the University. The advantages of the library,

laboratories, herbarium, and collections of living plants at the Garden are freely at the disposal of students registered at New York University for such work. Such properly enrolled graduate students are charged no additional fees by the Garden. The following courses are approved by the faculty of the Graduate School of New York University and are given credit as full courses:

E6. Research in Mycology and Plant Pathology.—Investigation of problems relating to fungi and fungous diseases of plants.

Dr. Reed.

E8. Research in Forest Pathology.—Investigation of the diseases of woody plants.

Dr. Graves.

E9. Research in the Structure of Flowers. Dr. Gundersen.

E10. Research in the Systematic Botany of the Flowering Plants.

Dr. Svenson.

2. Independent Investigation

The facilities of the laboratories, conservatories, library, and herbarium are available to qualified investigators who wish to carry on independent researches in their chosen field. There is a charge of \$25 per year, payable to the Botanic Garden.

V

MISCELLANEOUS

Press Releases

In order to keep the public informed of events at the Garden news items are sent at fairly regular and frequent intervals to the metropolitan dailies and to many of the suburban papers. These news releases consist of announcements of the periods when the principal floral displays are at their best, of the acquisition of new plants, the blossoming of rare species, improvements in the plantations, the installation of new collections and exhibits, the results of research and exploration, etc. The beginnings of the various public courses, as well as public lectures, meetings of various societies at the Garden, Flower Days, and social events are also announced through the public press.

Broadcasting

During 1934 members of the Garden personnel gave 46 radio talks on general botanical or horticultural topics and concerning the Brooklyn Botanic Garden, as follows: Over WOR, 15; WNYC, 31.

The talks over WOR were given in cooperation with the Co-operative Extension Work in Agriculture and Home Economics of the State of New Jersey. In connection with these talks a Radio Garden Club and a Junior Radio Garden Club have been organized. Bulletins are sent regularly to the members of these clubs, and a "fan" mail has developed as a bureau of information on horticultural topics.

Broadcasting, including the cooperation with the State of New Jersey, is being continued during 1935, and will be continued during 1936. Those interested should watch the daily paper announcements for talks on gardening and plant life.

Circulars of Information

Circulars descriptive of the various courses and lectures are distributed, without charge, to a regular mailing list which includes Brooklyn Botanic Garden officials and members, members of the Woman's Auxiliary, all the libraries and schools of Greater New York, registered and former students, and others. Requests to be placed on this mailing list should be addressed to the *Curator of Public Instruction*.

Popular Publications

Leaflets.—The publication of the Brooklyn Botanic Garden *Leaflets* commenced in 1913. Approximately ten numbers—sometimes more—constitute a Series, one series being issued each year. The current series is Number XXIII. At the end of every four years, for convenience in binding, a table of contents of the *Leaflets* published during the four year period is issued.

The purpose of the *Leaflets* is primarily to present popular information about plant life in general for teachers and others, and to give announcements concerning flowering and other plant activities to be seen in the Garden near the date of issue. The

Leaflets are free to members of the Garden and (on request) to teachers in the schools of Greater New York. For others, the subscription is 50 cents per year, or 5 cents a number (4 pages).

Besides the *Leaflets*, numerous popular articles on various phases of plant life and gardening are written by members of the staff for publication in periodicals and newspapers.

The Plant World.—By C. Stuart Gager. A popular introduction to the more interesting facts concerning the plant life of the earth, and the importance of plants in our daily lives. 136 pages; 79 illustrations. Price 75 cents. On sale at the Information Desk and Entrance Gates, and by mail.

A Teaching Guide to the Trees and Shrubs of Greater New York.—By Arthur H. Graves and Hester M. Rusk. A handbook used in Botanic Garden classes, of brief, non-technical descriptions of the woody plants of the Greater New York region, with the characters by which they may be recognized in summer or winter. Keys, a glossary, and index are appended. ix + 76 pages. Price 75 cents. On sale at the Information Desk and Entrance Gates, and by mail.

Illustrations of Flowering Plants of the Middle Atlantic and New England States.—By the late George T. Stevens, M.D. Edited by Alfred Gundersen. Contains 199 plates and index of about 1500 species of the commoner flowering plants, exclusive of the grasses and sedges. Reprinted primarily for use in Brooklyn Botanic Garden classes. Price \$1.00. On sale at the Information Desk and Entrance Gates, and by mail.

Guide Books, Maps and Souvenir Postcards of the Garden

During the last few years, Guide Books have been published from time to time, as special numbers of the *Brooklyn Botanic Garden Record*, based upon and explaining various Botanic Garden features and exhibits.

Each of these publications is more than a guide to an exhibit; it is an elementary treatise on the general subject illustrated by the Garden feature or exhibit. In this way the Guides have value even for those who may not be able to visit the Botanic Garden. The following numbers have been published:

Guide No. 2. Gardens within a garden: A general guide to the grounds of the Brooklyn Botanic Garden. By C. Stuart Gager.

May, 1929. 36 pages, 16 illustrations and map. Price, 25 cents. Out of print.

Guide No. 3. The story of our metate: A chronicle of corn. By F. W. Hodge. November, 1929. 25 pages, 14 illustrations. Price, 25 cents.

Guide No. 4. The Japanese Garden of the Brooklyn Botanic Garden. By Bunkio Matsuki. July, 1930. 38 pages, 20 illustrations. Price, 35 cents; by mail, 40 cents. Out of print.

Guide No. 5. The Rock Garden of the Brooklyn Botanic Garden. By Montague Free. May, 1931. 55 pages, 28 illustrations. Price, 35 cents; by mail, 40 cents.

Guide No. 6. Japanese potted trees (Hachinoki). By Bunkio Matsuki. November, 1931. 16 pages, 11 illustrations. Price, 35 cents; by mail, 40 cents.

Guide No. 7. The story of our boulders: Glacial geology of the Brooklyn Botanic Garden. By C. Stuart Gager and Ernst Antevs. May, 1932. 43 pages, 22 illustrations. Price, 35 cents; by mail, 40 cents.

Guide No. 8. The story of fossil plants. Guide to the eight transparencies in Conservatory House No. 2. By Edward W. Berry. July, 1932. 29 pages, 8 illustrations. Price, 35 cents; by mail, 40 cents.

These Guides are mailed free, as published, to members of the Garden. Additional copies at regular rates. Similar guides are in preparation and will be published from time to time.

Books and manuscripts illustrating the history of botany: An annotated list. By Emilie Perpall Chichester and C. Stuart Gager. July, 1935. 36 pages. Price, 40 cents. Based upon incunabula and other items in the Library of the Brooklyn Botanic Garden.

A detailed map of the Garden, showing not only the various types of gardens included in the Botanic Garden area, but especially the location of the various orders and families in the Systematic Section, is appended to the General Guide (Guide No. 2). Copies are on sale at 5 cents each.

A colored picture map of the Garden, $7\frac{1}{2} \times 3\frac{1}{2}$ feet, designed and executed by Miss Helen Sewall, is on view in the Laboratory Building. This map was presented to the Garden at the Annual Spring Inspection, May 14, 1929, by members of the Woman's

Auxiliary and other friends, as a memorial to Dr. Glentworth Reeve Butler (1855-1926), and in grateful recognition of the services of Mrs. Butler, chairman of the Woman's Auxiliary, 1926-1932. Photographs of this map (in black and white. $6\frac{1}{2} \times 4\frac{1}{4}$ inches) may be had at 20 cents each.

Souvenir postcards, in colors, may be had at 10 cents a set (7 cards); three for 5 cents; 2 cents each. The subjects are: Scene in the Children's Garden; The Brook; Daffodils in the Lawn; The Lake; Children's Building and Formal Garden; The Rock Garden (Waterfall and Iris); The Japanese Garden (Wisteria); Inflorescence of Sago Palm (*Cycas revoluta*).

Orders for guide books, maps, and souvenir postcards, accompanied by remittance, should be sent to *The Secretary*. These articles may also be obtained at the Information Desk in the Laboratory Building, and at the Entrance Gates.

VI

OTHER EDUCATIONAL FEATURES

Plantations

The plantations comprise the following sections and gardens:

1. General Systematic Section (trees, shrubs, and herbaceous plants arranged according to orders and families).
2. Local Flora Section (Native Wild Flower Garden). Arrangement ecological.
3. Ecologic Garden. (Temporarily discontinued.)
4. Japanese Garden.
5. Rock Garden.
6. Rose Garden.
7. Iris Garden.
8. Water Gardens (Lake, Brook, Swamp, Bog, Pools).
9. Children's Garden.
10. Shakespeare Garden.
11. Horticultural Section, including a Wall Garden.
12. Conservatory Plaza (Water Lilies, Herbaceous Borders).
13. Laboratory Plaza (Magnolias).

14. Various horticultural collections, as for example :
 - Flowering cherries, plums, apples, etc.
 - Lilacs.
 - Peonies.
 - Azaleas and Rhododendrons.
 - Iris (Bearded and Japanese).
 - Cannas.
 - Dahlias.
 - Hardy Asters.
 - Hardy Chrysanthemums.
15. Miscellaneous plantations.
 - a. Naturalistic plantings of bulbs.
 - Crocus, Daffodils, Poets Narcissus, etc.
 - b. Decorative and screen plantings.
16. Experimental Garden (Test Garden for Beardless Iris ;
Plant Pathology and Plant Breeding Plots).
17. Nursery.

As noted under Docentry (p. 200), arrangements may be made for viewing the plantations under guidance. They are open free to the public daily from 8 a.m. until dusk ; on Sundays and holidays from 10 a.m. until dusk.

Automobiles.—Automobiles are not regularly admitted to the Garden. On application to the Director special permits for automobiles are issued, *to members only*, to enable those who may not be able to walk through the plantations to enjoy the Garden. Arrangements must be made in advance (preferably one day in advance). *In every case the car must be accompanied by a representative of the Garden.*

Systematic Section

The main part of the outdoor plantations is devoted to the Systematic Section, which extends from north to south through the central part of the Garden. Here the plants are grouped according to their botanical relationships, in orders, families, and genera, following approximately the Engler system of plant classification. From the simpler and more primitive types of plants at the north end, to the more highly developed groups at the south, the Sys-

tematic Section comprises representative members of the families of plants which are hardy or semi-hardy in this climate. In accordance with this arrangement, the ferns and the conifers and other gymnosperms are at the northern end. Then follow the trees, shrubs, and herbaceous plants of the various families of dicotyledons. Along the east side of the Brook are the polypetalae. Along the west side of the Brook are the monocotyledons (north of the Rock Garden), and the sympetalae (south of the Rock Garden). The catkin-bearing trees and shrubs follow the line of the Brook. Wherever possible, the plants chosen to represent their groups are those which are of interest from both botanical and horticultural points of view.

Local Flora Section

This is an area of about two acres devoted to plants native within approximately 100 miles of Brooklyn (the Torrey Botanical Club range). The following ecological units are represented: bog, sand barren, pond, meadow, and woodland. Nearly all the native plants of general interest are well established here, with the exception of the ferns inhabiting limestone areas. There is as yet no suitable place for these. Although the section is not yet open to the general public, arrangements may be made with the *Curator of Public Instruction* for its inspection by botany classes, to whose needs this area is especially adapted.

Japanese Garden

The Japanese Garden, first opened to the public in 1915, was made possible by a gift to the Botanic Garden of \$12,500 from Mr. Alfred T. White, "the father of the Botanic Garden." The design, by the Japanese landscape architect, Mr. Takeo Shiota, carries out faithfully the Japanese idea of a *Niwa*, or landscape garden. From the tea house (near the east entrance) one can see the *machiai* or "rest house," the island with the drum bridge, bronze storks, stone and wooden lanterns, the waterfalls, and the wooden Torii standing in the lake, recalling the one at Miyajima, Japan. Since January 1, 1919, this Garden has been in charge of Miss Mary Averill, honorary curator of Japanese gardening and

floral art, and has been steadily improved, under her supervision, by Japanese gardeners. For details and explanations of the meaning of the various features see "The Japanese Garden of the Brooklyn Botanic Garden": Guide No. 4. (*Brooklyn Botanic Garden Record* 19: 197-234. July, 1930.) Out of print, but available in libraries.

Rock Garden

The Rock Garden, constructed in the spring of 1916, is, in point of time, perhaps, the first rock garden of any considerable size in a public garden or park in the United States. The rocks used in its construction are glacial boulders which were uncovered in the course of grading operations on other parts of the grounds: they are the only "native" rocks on Long Island, with the exception of one small outcrop on the northwest shore. The general idea in making the garden was that of representing a boulder-strewn slope, but this design, of necessity, was modified in places to provide proper cultural conditions as to drainage, depth of soil, and shade. The garden is planted with about eight hundred species and varieties of alpine, saxatile, and other plants suitable for rock garden culture.

Although the rock garden enthusiast may expect to find something of interest in bloom during every month of the year, it is in April, May, and June that the Rock Garden provides its greatest display of blossoms. In several years there have been flowers in bloom in the Rock Garden in each of the twelve months. Persons interested in rock gardening will find Guide No. 5, *The Rock Garden of the Brooklyn Botanic Garden*, helpful; also, *Leaflets*, Series XI, No. 6, *The Rock Garden*.

Conservatory Plaza and Waterlily Pools

The initial development of the Conservatory Plaza and Waterlily Pools, including the paved walks, eight stone seats, four herbaceous borders, south pool for hardy waterlilies, and north pool for sub-tropical and tropical forms, was due to a gift to the Botanic Garden of \$19,260 in 1919 and 1920 from Mr. Alfred T. White. The south pool contains 26 hardy species, and the north

(heated) pool 42 tender species. For the latter the Garden is indebted to the perennial generosity of William Tricker, Inc., Saddle River, New Jersey.

Rose Garden

The Rose Garden, occupying about one acre in the northwest part of the Botanic Garden, was formally opened to the public on Sunday afternoon, June 24, 1928. This garden was made possible by a gift of \$15,000 from Mr. and Mrs. Walter V. Cranford, of Greenwich, Connecticut.

The general plan of the Garden is as follows: At the north end, entrance is gained through a Doric pergola. Three parallel rows of beds extend to the southward from the pergola, as far as the pavilion. In the central row of beds, varieties of hybrid perpetuals have been planted along with many of the small polyantha type; each of the two side rows contains varieties of hybrid teas. In the arrangement of these varieties the older forms appear at the beginning, near the pergola, the most recent productions near the pavilion, with the intermediate forms in chronological sequence between. Varieties of pillar and post roses are planted at regular intervals, on suitable supports, in the beds, with standards between the beds of the side rows. The trellis surrounding the garden, and also the pergola and pavilion, furnish support for climbing roses, while the marginal beds along the trellis are for wild species and their derivatives. South of the pavilion, three additional beds are devoted to historical roses, *i.e.*, those mentioned in ~~ancient~~ literature, and to roses of commercial use.

The Rose Garden is open to the public from 9 a.m. to 5 p.m. on weekdays (except holidays) during the rose season, and from 10 a.m. to 7 p.m. in June. Children are admitted only when accompanied by responsible adults.

Flower Days

In order to afford members of the Garden and friends whom they may invite, an opportunity to see, under expert guidance, some of the most conspicuous and interesting floral displays of the Garden; to assist them toward solving some of their own gar-

dening problems; and to enable them to meet for discussion, a series of special days, called Flower Days, was inaugurated in 1927. The dates selected are those in which the particular flowers furnishing the theme for discussion are in their prime. Up to and including 1935 the following "Days" have been observed:

Crocus Day	Rose Garden Day (June)
Daffodil Day	Japanese Iris Day
Tulip Day	Water Garden Day
Rock Garden Day	Fall Rose Garden Day
Japanese Garden Day	Canna Day
Iris Day	Chrysanthemum Day

On each of these occasions a specialist gives an illustrated talk on the flower of the Day, followed by a tour of inspection of the flowers in bloom on the grounds of the Garden. The speakers are either members of the Garden staff who have made a special study of the flowers in question, or invited experts in their breeding or culture. During the outdoor inspection there is free discussion of questions of desirable varieties, culture, disease, etc. On returning to the Laboratory Building, tea is served. The exercises commence at 3:30 p.m.

These Flower Days, now an established feature of the Garden's activities, have come to be of more than local interest. In 1934 the Botanic Garden's "Rock Garden Day" was the occasion of the first annual meeting of the American Rock Garden Society. Similarly, in other years, the American Iris Society and the American Rose Society have held their meetings at the Garden and have joined with the Garden members in the celebration of their respective Flower Days.

Conservatories

The Garden conservatories contain a collection of tender and tropical plants. Of special interest for teachers of nature study and geography are the following useful plants from the tropics and subtropics: banana, orange, lemon, lime, kumquat, tamarind, West Indian cedar (the source of the wood used for cigar boxes), eucalyptus, Manila hemp, sisal, pandanus (source of the fiber used for making certain kinds of fiber hats), fig, grapevines from north

and south Africa, date palm, coconut palm, chocolate tree, coffee, tea, ginger, bamboo, mahogany, balsa, cocaine plant, black pepper, annatto (used in coloring butter and cheese), cardamom, olive, pomegranate, logwood, durian, mango, sugar cane, avocado (so-called "alligator pear"), West Indian and other rubber plants, banyan, religious fig of India, and numerous others.

It may be of interest to teachers of botany that the nine extant genera of cycads are represented in House 12. To reach the Cycad House take the first door to the *left* after entering the central or Economic House and pass through to the end house.

The Conservatories are open April 1 to October 31, 10 a.m.-4:30 p.m. (Sundays, 2-4:30); November 1 to March 31, 10 a.m.-4 p.m. (Sundays, 2-4).

Herbarium

The Garden herbarium consists at present of about 200,000 specimens, including phanerogams, ferns, mosses, liverworts, lichens, parasitic and other fungi, algae, and myxomycetes. This collection may be consulted daily (except Sundays and holidays) from 9 a.m. until 5 p.m., Saturdays from 9 a.m. to 12 m. Specimens submitted for identification will be gladly received. Address the *Curator of the Herbarium*.

Library

The rapidly growing library of the Garden comprises at present more than 18,600 volumes and about 15,000 pamphlets. This is not a circulating library, but is open free for consultation to all persons daily (except Sundays and holidays) from 9 a.m. until 5 p.m. (Saturdays, 9 to 12). Nearly 1,000 periodicals and serial publications devoted to botany and closely related subjects are regularly received. These include the transactions of scientific societies from all quarters of the globe; the bulletins, monographs, reports, and other publications of various departments of the United States Government, as well as those of foreign governments, and of all state agricultural experiment stations and agricultural colleges; the publications of research laboratories, universities, botanic gardens, and other scientific institutions of the world,

as well as the files of independent journals devoted to the various phases of plant life. The library is specially rich in publications of foreign countries and has a growing collection of incunabula and other pre-Linnean works.

Bibliographical assistance is rendered to readers by members of the Library staff.

An annotated list of the incunabula, pre-Linnaean works, old herbals and other rare or historically important books in the Library was published as the July, 1935, number of the Botanic Garden RECORD. Copies are for sale at 40 cents each.

Laboratory Building

The Laboratory Building contains (besides offices of administration and the Library and Herbarium mentioned above) four laboratory rooms, a culture room, three classrooms with stereopticon and other equipment for instruction, a room for the installation of temporary exhibits, six private research rooms, and an auditorium seating about 570 and equipped with motion picture machine, stereopticon, and lecture table supplied with water, gas, and electric current for lectures involving experimental work.

Instructional Greenhouses

A range of three greenhouses, each about 20 x 30 feet, is provided for the practical instruction of children and adults in plant propagation and other subjects.

Children's Room

A gift of \$1,500 in 1921 from Mrs. Helen Sherman Pratt, supplemented in 1923 by a further gift of \$500 from Mr. George D. Pratt, has made it possible to provide a beautifully decorated room for the use of the Boys' and Girls' Club. Any boy or girl who is enrolled, or has been enrolled, in any of the children's classes at the Garden is eligible for membership in this club, which now numbers about 1,000 active members. The room contains shelves for a nature-study library, of which a nucleus has already been secured, and is equipped with stereoscopic views, photographs, and preserved and living specimens of plant life, for the instruction

and entertainment of boys and girls. The room is open free to all children. Contributions of specimens and of books on nature study and closely related subjects will be most welcome.

Children's Building

This is located in the northern part of the Children's Garden plot and contains a conference room, and rooms for the storage of garden tools and implements. The furniture in the conference room was a gift from Mrs. James H. Post. Various collections of plants, seeds, and insects of economic importance in the garden are accessible here for consultation by the children. A garden library, a gift of friends, has been added. North of the Children's Building is a plot planted to ornamental shrubs and herbaceous perennials for the instruction of the children.

Children's Garden

A plot of about three-quarters of an acre in the southeast part of the Botanic Garden is devoted to the theoretical and practical instruction of children in gardening. The larger part of this area is laid out in garden plots which will accommodate about 200 children. At the south end is a Shakespeare Garden, given by Mrs. Henry W. Folger.

Non-Botanical Educational Features

Meridian Panel.—In 1931 there was placed in the paved walk in front of the main west entrance to the Laboratory Building a Terrestrial Position Panel, briefly referred to as the "Meridian Panel." This panel, of black Belgian marble terazzo, is 21 feet, 2 inches long, and 5 feet wide. It contains a brass strip, 20 feet long and $\frac{7}{8}$ inch wide, laid along the geographical meridian, the location of which was accurately determined by Mr. Weld Arnold, then of the School of Surveying of the American Geographical Society, but now of the School of Geography, Harvard University.

Another brass strip, $18\frac{1}{2}$ feet long and $\frac{3}{4}$ inch wide, marking the magnetic meridian, crosses the geographical meridian at an angle of $11^{\circ} 11'$. The data at the ends of the meridians are as follows:

At the North End:

Magnetic north. Variation $11^{\circ} 11'$ west in 1931

Annual increase $4'$

At the South End:

Altitude above mean sea level, 115 feet

North latitude, $40^{\circ} 40' 06''$

Longitude west of Greenwich, $73^{\circ} 57' 48''$

To the North Pole, 3416.7 miles

To the Equator, 2798.2 miles

This feature is proving of much public interest, and the data are constantly being copied by school classes and others.

Armillary Sphere.—The central feature of the Laboratory Plaza is the large Compass and Armillary Sphere erected in 1933. This was made possible through a bequest of the late Alfred W. Jenkins, a former member of the Botanic Garden Governing Committee. The Armillary Sphere consists of circular bands of bronze representing the principal celestial circles, and has been designed to serve also as a sun dial. Strictly, an armillary sphere should have either the earth or the sun represented in its center, but here, in order to make it serve as a sun dial, these are omitted, and a slender metal rod, extending from the south to the north pole of the sphere, serves as a gnomon. From the shadow thrown by this rod the correct sun time is indicated on a dial on the inner surface of the equatorial band. By means of the "Equation of Time" inside the sphere, this can be changed to Standard Time. The signs of ~~the~~ zodiac are to be seen on the outside of this broad band (as the band of the ecliptic where they are usually placed is too narrow to receive them): they were modelled by Miss Rhys Caparn, sculptor. The north pole points to the North Celestial Pole. The sphere is mounted on a pedestal of Carver black granite from Vinal Haven, Maine. A bronze band encircling the pedestal bears the following classic sun dial motto:

"Serene I stand amyddst ye flowres
To tell ye passing of ye howres."

The pedestal rests on an octagonal platform of Stony Creek (Connecticut) pink granite, and the whole is mounted at the center of a large circular compass paved with marble terrazzo in four colors,

each color representing a different point of the compass. The marble chips used in the terrazzo are of various origins, the red marble coming from Massa, Italy, the black from Mazy, Belgium, the green from Cardiff, Maryland, and the yellow from Siena, Italy. The armillary sphere (with pedestal) and the compass, as well as the entire Plaza, were designed by Mr. Harold A. Caparn, landscape architect of the Botanic Garden.

Labeled Boulders.—The Brooklyn Botanic Garden is located near the western end of the terminal moraine of Long Island. This moraine was deposited at the southern edge of the continental glacier that occupied the northern part of North America, during the last Ice Age. The southward-moving ice picked up and carried along innumerable boulders derived from rock ledges in various localities north of what is now Long Island. During their journey, these boulders were rounded and polished and, in some cases, marked with striations that still persist. Twenty-eight of these boulders have had their lithological composition carefully determined and compared with that of rock ledges to the north. By this study it has been possible to determine, with a fair degree of accuracy, the approximate places from which the boulders now in the Botanic Garden were derived. Bronze tablets, given by President Edward C. Blum, of the Board of Trustees, have been placed on these boulders, telling their composition and probable place of origin, and stating that they were brought to the Garden by the continental ice-sheet during the glacial period.

A similar bronze tablet is mounted on a boulder at the foot of Boulder Hill (which takes its name from the large glacial erratic on its summit). The inscription reads, "Boulder Hill and the entire northern portion of the Botanic Garden are part of the terminal glacial moraine extending from The Narrows to Montauk Point. This tablet was given in 1932 by the Boys' and Girls' Club of the Brooklyn Botanic Garden."

Guide No. 7, *The story of our boulders*, has been prepared for the use of classes in geography or geology, or others who may be interested. Copies may be obtained at the Information Desk and Entrance Gates at 35 cents each; by mail, 40 cents. Arrangements may be made in advance for docents to conduct classes who wish to study these labeled boulders.

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